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DISEASES

OF

WOMEN

BY

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LATE EXAMINER IN OBSTETRIC MEDICINE
TO THE UNIVERSITIES OF OXFORD, CAMBRIDGE, AND LONDON

Author of "A Manual of Midwifery for the Student and Practitioner"

SIXTH EDITION, MUCH ENLARGED

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PREFACE TO THE SIXTH EDITION.

In the present edition the book has been extended to double its original size. Detailed descriptions, with illustrations, have been introduced of the modern methods of performing gynæcological operations, abdominal, vaginal, and perineal.

Special chapters have been added on the management of gynæcological operations, and on the diseases of the urethra and bladder. One hundred and forty-nine new figures have been added, including twenty-three micro-photographs.

Some alterations have been made in the arrangement of the book, displacements of the uterus now appearing after inflammation.

Figure 144, showing Hodge's pessary in position, Figures 148, 149, 150, showing the mode of its introduction, Figure 179, showing Le Fort's operation, and Figures 163, 165, 167, showing other pessaries in position, are drawn to a scale two-sevenths the size of nature. In Figure 22, showing the mode of introducing the uterine sound, and in Figures 99, 156, 157, 158, 159, illustrating the varieties of prolapse and hyperplasia of the uterus, the scale is two-ninths of the natural size.

49, Wimpole Street,
October, 1903.

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DISEASES OF WOMEN.

CHAPTER I.

ANATOMY OF THE FEMALE GENITAL ORGANS.

THE female genital organs are commonly divided into two groups—(1) The external organs, comprising the Mons Veneris, with the structures included in the vulva, namely, the labia majora and minora, clitoris, vestibule, fossa navicularis, and fourchette; and (2) The internal organs, comprising the vagina, uterus, Fallopian tubes, and ovaries.

The *Mons Veneris* (Fig. 1 : 12) is a rounded prominence above the pubes, consisting of fat and cellular tissue, covered, from the time of puberty, with hair.

The *Labia Majora* (Fig. 1 : 1) form the lateral boundaries of the vulva. They consist of two thick, nearly parallel folds of skin, continuous in front with the Mons Veneris. Posteriorly they converge slightly, and are continued rather farther back than the anterior margin of the perineum. In the adult, they are covered with stout crisp hair, more abundant on the outer surface than the inner. They contain fat and cellular tissue, also elastic and unstriped muscular fibres, similar to those of the dartos in the male. They are provided with sebaceous and sweat glands.

The labia majora correspond in development to the scrotum. Hence the cleft scrotum in a case of hypospadias in the male resembles more or less the labia majora, and, in infancy, may lead to a mistake as to sex. An inguinal hernia descends into the labium majus, as it does in the male into the scrotum. Occasionally a hydrocele, derived from the end of the process of peritoneum shut off, is found there.

The labia majora, forming the outlet of the vulva, look downward in the upright position of the adult, so that the Mons Veneris only is seen from the front. Normally, in the virgin, their internal borders are in contact, so that they cover and conceal the clitoris and nymphæ. But, when the nymphæ are larger than usual, they project between the labia majora. In the infant, the labia majora are directed somewhat more forward, and do not so much conceal the internal parts.

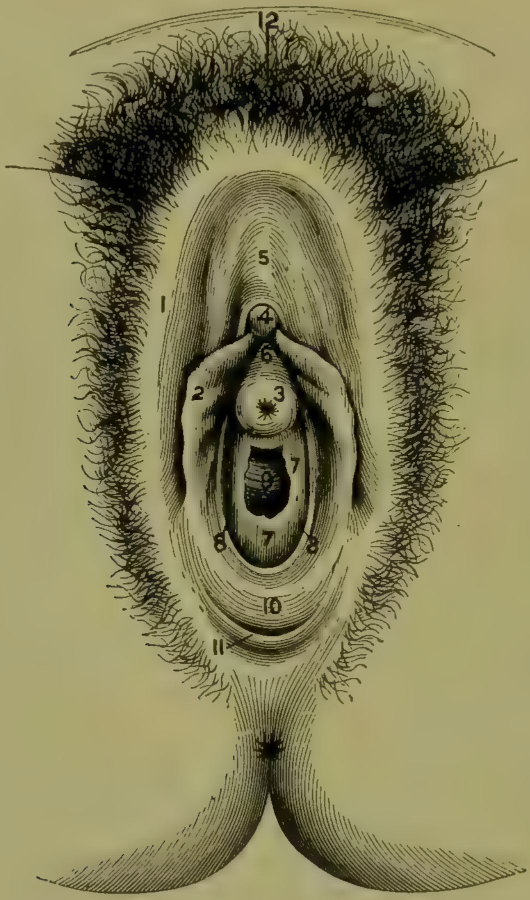

Fig 1.—The Vulva in the Virgin, as seen when its sides are separated by lateral traction.

1, labium majus; 2, labium minus; 3, meatus urinarius; 4, glans clitoridis; 5, clitoris, 6, vestibule 7, hymen; 8, duct of vulvo-vaginal gland; 9, vagina; 10, fossa navicularis; 11, fourchette.

The *Labia Minora* or *Nymphæ* (Fig. 1 : 2) are two folds of skin, one on the inner border of each labium majus. Anteriorly, they converge, and divide into two branches. The upper branch passes above the clitoris, and unites with its fellow to form the prepuce of the clitoris. The lower unites with its fellow below the clitoris. The development of the nymphæ varies considerably. Usually they are lost on the inner border of the labia majora at about the junction of the middle and lower third of the lateral border of the vulval orifice. But they may extend only one-third of the way down that border, or they may extend its whole length, uniting with the fourchette, which then forms the junction between them at the posterior limit of the vulva, and is thrown into relief, if the nymphæ are drawn forward. A slight development of the nymphæ is often associated with a scanty growth of pubic and vulval hair. The nymphæ are covered with thin delicate skin, approximating in appearance to mucous membrane. Hence they used to be described as folds of mucous membrane. But, being skin, their glands are not mucous glands, but sweat and sebaceous glands, the latter being especially numerous about the prepuce of the clitoris. The nerve terminations also correspond to those found in skin and not in mucous membrane.

The line of demarcation between skin and mucous membrane can sometimes be seen in a young girl. It runs within the nymphæ, at the sides of the vestibule, and crosses the fossa navicularis between the fourchette and the hymen.

The *Clitoris* (Fig. 1 : 4, 5) corresponds, on a small scale, to the penis, except that it is not perforated by the urethra, and has no corpus spongiosum. It arises by two crura attached to the rami of the pubes. These unite superiorly to form the body of the clitoris, consisting of two corpora cavernosa, united in the middle line. The glans clitoridis only is free above the level of the mucous membrane. The clitoris has also a suspensory ligament attached to the symphysis pubis. It is erectile, and is supplied by the pudic artery and pudic nerve, like the penis. The prepuce of the clitoris forms a kind of hood above it, but does not completely cover it.

The *Vestibule* (Fig. 1 : 6) is a triangular surface of mucous membrane, somewhat less than an inch in length. The apex, in front, is formed by the clitoris. Its sides are formed by the diverging nymphæ, and its base by a transverse line constituting the entrance of the vagina. At the centre of this base is the urethral orifice, or *meatus urinarius* (Fig. 1 : 8), from which the hymen diverges at each side. The vestibule contains mucous glands.

The *Hymen* (Fig. 1 : 7) forms the separation between the vulva and the vagina. It consists of a fold of mucous membrane, generally crescentic with its concavity forward, and terminating anteriorly at the meatus urinarius, where it is represented only by a thickening of the mucous membrane, which causes the posterior border of the meatus to be more prominent than the anterior. Often this thickening forms a rim directed forwards, and somewhat overlapping the meatus. Sometimes the hymen is annular, but narrower in front than posteriorly. In rare cases, the vagina is closed, either by an imperforate hymen, or by a septum immediately behind the hymen. A cribriform opening to the hymen is described as occasionally seen, but is very rare. Two lateral openings divided by a vertical septum are less rare. In the virgin the orifice of the hymen is closed by apposition of its sides so as to form a longitudinal slit, or stellate figure, with its greatest axis longitudinal, the edges of the hymen being everted, so as to look downward. Thus, in the undisturbed position, the hymen generally takes the form of a third pair of longitudinal lips, internal to the labia majora and minora. Occasionally the hymen is fringed, and may then appear like a double fold on each side. The vagina is not seen as shown in Fig. 1, until the sides of the vulva are drawn apart. In rare cases, the hymen forms a transverse slit. Immediately behind the hymen the vagina forms a transverse slit in all cases.

In young women who are virgins, the index finger can generally be passed by careful pressure through the orifice of the hymen without causing any rupture. In an elderly virgin the edge of the hymen is much more rigid, and the finger frequently cannot be passed. The hymen may be so lax and dilatable as to allow complete coitus without any rupture. A hymen, therefore, which visually appears intact is not a complete proof of virginity, but only one which will not allow, or will only with some difficulty allow, the index finger to pass. In a woman no longer a virgin, but nulliparous, the edges of the hymen are usually notched at several places nearly to its base, but the base can be traced as continuous. In a parous woman the base is no longer continuous. There may be isolated portions of the hymen remaining, separated by gaps of smooth mucous membrane: or the hymen may be represented only by isolated tags, the *carunculæ myrtiformes.* The characteristic fact is that there has been not merely laceration, but more or less sloughing of intermediate portions from pressure. This effect upon the hymen is the most constant of all the signs of parity.

The *Fourchette* (Fig. 1 : 11) forms the anterior margin of the perineum. In most cases, when the parts are at rest, there is no sharp fold of skin, but only a gradual convexity from the perineum as far as the hymen. (*See* Fig. 2 : 9, p. 5.) The skin is drawn forward into a fold when the vulva is stretched laterally by the fingers, or by the fœtal head advancing in parturition. In some cases, however, the fold exists in all positions. This is so especially when the nymphæ are longer than usual; and the fourchette then unites their posterior extremities, as may be seen by drawing them forward. When the nymphæ do not extend so far, the fourchette is lost laterally on the sides of the labia majora, a little anterior to their ends. It does not unite the posterior extremities of the labia majora, as is often stated.

The *Fossa Navicularis* (Fig. 1 : 10) is the space between the fourchette and the hymen. It only assumes the form of a boat-shaped depression when it is stretched laterally by an index finger placed in it on each side. The demarcation between skin and mucous membrane crosses it.

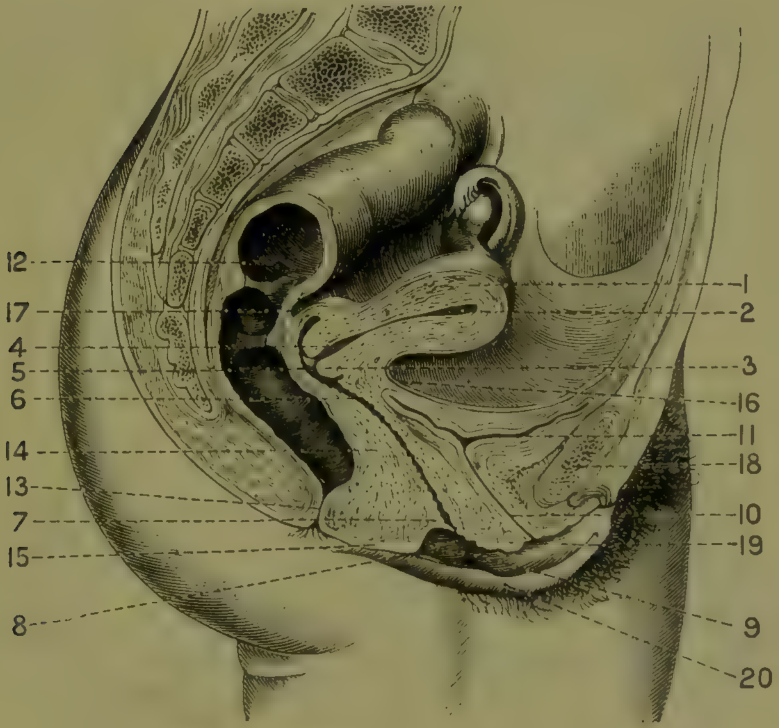

Fig. 2.—Vertical Section of Pelvis in the Virgin.

1, body of uterus; 2, its cavity; 3, the vaginal portion; 4, canal of cervix; 5, os uteri externum ; 6 the vagina; 7, hymen; 8, fourchette; 9, fossa navicularis; 10 urethra; 11, bladder; 12, rectum; 13, anus; 14, recto-vaginal septum; 15, perineum, forming the lower border of the triangular perineal body; 16, vesico-uterine fossa of peritoneum; 17, recto-vaginal or Douglas's fossa of peritoneum; 18, os pubis; 19, labium minus; 20, labium majus.

The *Bulbi Vestibuli* are elongated plexuses of veins lying one at each side of the vaginal orifice, partially covered toward its outer side by the sphincter vaginæ muscle. (Fig. 3 : 5, p. 6.) They lie in front of the anterior layer of the triangular ligament, and, anteriorly, are united by a tapering extremity to the glans clitoridis. They are regarded as corresponding to the corpus spongiosum in the male.

The *Vulvo-vaginal Glands*, or *Glands of Bartolini* (Fig. 3 : 4), lie one on each side of the vaginal orifice, somewhat behind the posterior extremity of the bulbi vestibuli, and between the two layers of the triangular ligament. The duct, about half an inch long, runs forward and opens just outside the hymen, a little below the centre of its lateral border. The glands correspond to Cowper's glands in the male, and secrete lubricating mucus under the influence of excitement and in labour.

The *Pelvic Floor* fills up the outlet of the bony pelvis, and is made up of certain muscles, with fasciæ and connective tissue. Its external surface is convex and covered with skin. It is pierced by the rectum, the orifice of which is firmly closed by the sphincter ani, and by the vagina, which forms a transverse slit, while the vulva is a longitudinal slit.

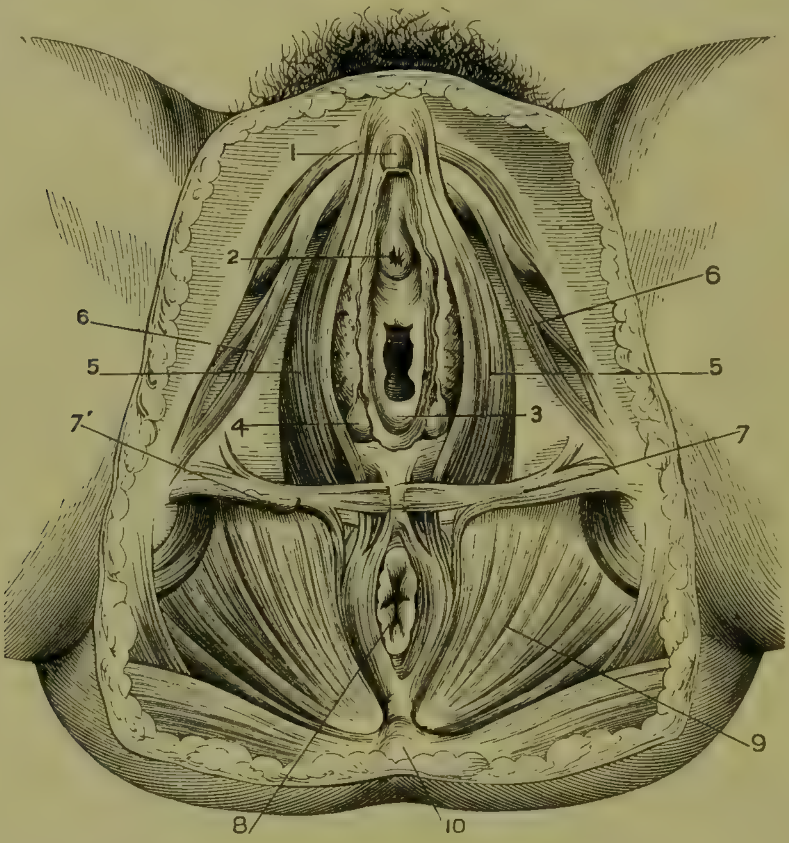

Fig. 3.—Muscles of Pelvic Floor.

1, glans clitoridis; 2, meatus urinarius; 3, hymen; 4, vulvo-vaginal gland; 5, sphincter vaginæ, or bulbo-cavernosus; 6, erector clitoridis, or ischio-cavernosus; 7, transversus perinei; 8, anus, with sphincter ani surrounding it; 9, levator ani; 10, coccyx.

Fasciæ of the pelvic floor.—The superficial fascia is formed by the subcutaneous connective tissue, and corresponds to the superficial fascia in other parts. The deep layer of the superficial fascia is attached laterally to the borders of the pubic arch, down to the level of the transversus perinei muscle. It dips down behind the transversus perinei (Fig. 3 : 7), and unites with the anterior layer of the triangular ligament. The triangular ligament consists of two layers attached to the anterior and posterior borders of the pubic arch.

Muscles of the Pelvic Floor.—The muscles, as seen from below, are shown in Fig. 3, p. 6; as seen from above in Fig. 4. The *sphincter vaginæ* (Fig. 3 : 5), or bulbo-cavernosus, consists of two flat superficial muscles, at each side of the vaginal orifice. Anteriorly each arises by three slips, close to the clitoris, posteriorly it blends in the perineal body with the transversus perinei and sphincter ani.

The *erector clitoridis* or *ischio-cavernosus* (Fig. 3 : 6) arises from the tuber ischii, and is inserted into the crus clitoridis. It is doubtful whether it has any influence in erecting the clitoris, but it has a function in drawing it backward in coitus.

The *transversus perinei* (Fig. 3 : 7) arises from the tuber ischii, and blends with its fellow in the perineal body. Thus these three superficial muscles, with the bulbi vestibuli, are contained in a pouch between the deep layer of the superficial fascia in front and the anterior layer of the triangular ligament behind, bounded below by the reflexion of the fascia at the lower border of the transversus perinei.

The strongest muscles forming the most important elements in the pelvic floor are the levator ani and the coccygeus. These are best seen in the view from above (Fig. 4). The *levator ani* (Fig. 4 : 5) is attached to the back of the pubes, to the white line of pelvic fascia crossing the obturator internus, and to the spine of the ischium. The anterior fibres form a loop around the vagina (Fig. 4 : 2′), and constitute the true sphincter to that canal, rather than the comparatively weak muscle called sphincter vaginæ. The middle fibres blend with the sphincter ani; the posterior unite with their fellows of the opposite side, and some are attached to the tip of the coccyx. In connection with this muscle, a narrow but firm fibrous band leaves the pubes at each side, near the apex of the pubic arch, and is lost upon the posterior vaginal wall, near its centre.

The *Coccygeus* arises from the spine of the ischium, and spreads out, in a fan shape, to be attached to the side of the coccyx, and lower part of the sacrum.

These two muscles together form a continuous sheet in the form of a diaphragm, closing the abdominal cavity below, convex and almost hemispherical as seen from below, concave as seen from above. The anus forms the pole of the hemisphere and is tightly closed by its sphincter. The weakest point of the diaphragm is the aperture for the vagina; but this cannot yield so as to allow prolapse of the viscera above, so long as the loop of fibres of the levator ani surrounding it (2′ Fig. 4) retains its tone.

The VAGINA (Fig. 2 : 6, p. 5) is a canal approximately parallel to the brim of the pelvis—that is to say, inclined at an angle of about 60° to the horizon. When unstretched, it forms a transverse slit, and has thus an anterior and posterior wall, which are in contact with each other. Each wall is broader above than below, and thus approximates to a triangular shape. The cervix uteri, the axis of which is nearly at right angles to the vagina, is inserted into the anterior wall at the upper part. The posterior wall is therefore longer than the anterior, the former measuring, when unstretched, about four, the latter about three inches. The vaginal walls are attached to the cervix uteri about half an inch

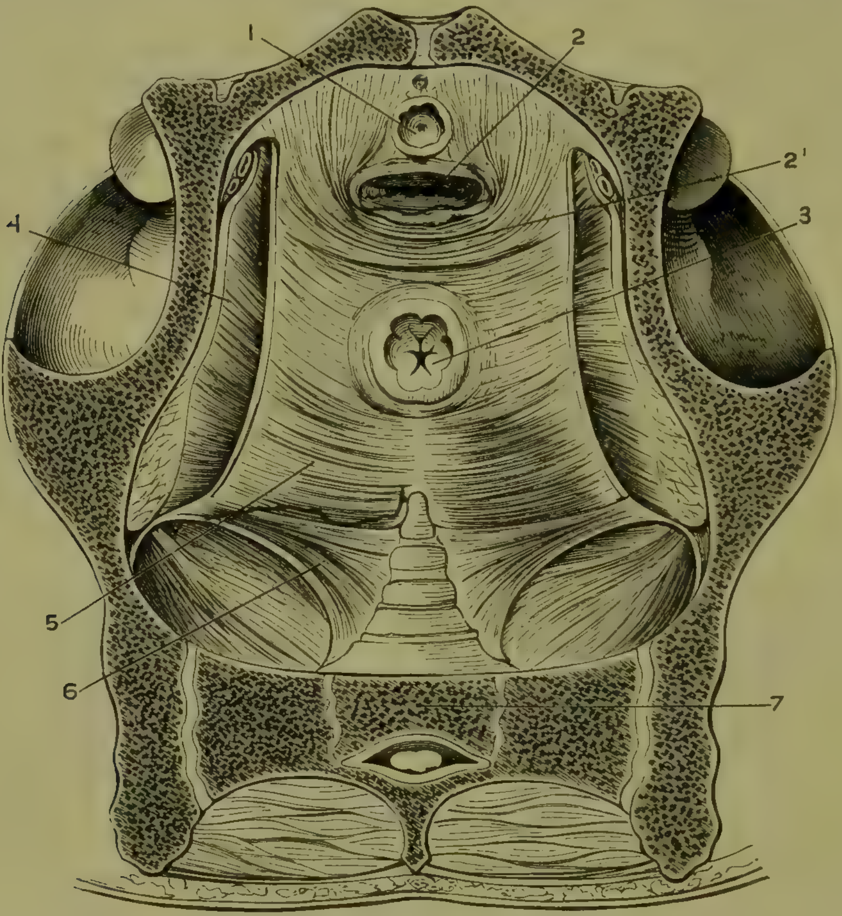

Fig. 4.—Muscles of Pelvic Floor seen from above.

1, urethra; 2, vagina; 2′, anterior fibres of levator ani surrounding vagina; 3, anus; 4, obturator internus; 5, levator ani; 6, coccygeus; 7, sacrum.

above the external os, rather higher behind than in front. (Fig. 6 : 9, 10, p. 11.) The projection of the cervix uteri into the vagina forms a depression all round. This is regarded as divided into an anterior, a posterior, and two lateral *fornices* or *culs-de-sac.*

The lining membrane of the vagina is mucous membrane, having a squamous epithelium. It is normally destitute of glands, although some anatomists describe occasional mucous glands as existing in it. The surface is thrown into numerous transverse rugæ, which facilitate its expansion in parturition. Outside the epithelium is a layer of connective tissue, containing some unstriped muscular fibres, then an internal longitudinal layer, and an external circular layer, of involuntary muscular fibres. At the centre of each wall towards its lower part is a prominent ridge, the relic of the formation of the canal by the coalescence of two halves. That on the anterior wall corresponds to the urethra. The anterior wall of the vagina is closely connected with the bladder, and still more so with the urethra. The posterior vaginal wall is separated from the rectum by loose connective tissue, which allows the vaginal wall to descend without carrying the rectum with it.

The posterior vaginal wall, in its normal condition, is rendered convex forward by the tonicity of the fibres of the levator ani which encircle it. Hence the canal is sigmoid-shaped in antero-posterior section, and the finger introduced into the virgin vagina impinges upon the cervix uteri in front of the os (Fig. 2, p. 5).

The *perineal body* (Fig. 2 : 15, p. 5) forms the lower part of the septum between vagina and rectum, where the walls of the two canals diverge. It is roughly triangular in antero-posterior section. The base is the *perineum*, or skin between anus and vulva; the apex is continuous with the upper and thin portion of the recto-vaginal septum. The main substance of the perineal body is made up of the intersections of muscles, mainly of those of the levator ani with the sphincter ani and sphincter vaginæ. It is thus a firm structure; and, when intact, supports the anterior vaginal wall in resisting the intra-abdominal pressure, which is exerted at right angles to the vaginal canal, or nearly so.

The *Rectum* in its lower portion is nearly parallel to the vagina, and the orifice of the anus is nearly at right angles to it, so that the finger passed through the anus impinges upon the recto-vaginal septum. In the rectal wall, from one and a half to two inches from the anus, are two crescentic folds, anterior and posterior, the posterior being the higher (Fig. 2, p. 5).

The UTERUS is a hollow muscular organ, having thick walls. On coronal section, it is seen to be made up of two parts, the body and cervix, differing in the character of their lining mucous membrane, and divided by a constriction, the internal os.

Regarding the uterus as a whole, the posterior surface is covered by peritoneum down to the level of the septum dividing the pouch of Douglas from the vagina, about half way down the posterior surface of the cervix. The attachment is very close at the upper part, but becomes looser over the cervix. The anterior surface is covered with peritoneum for its upper half; the lower half is in contact with the bladder, cellular tissue intervening, down to the level of the vaginal reflection. Laterally the peritoneum leaves the sides of the uterus to form the broad ligaments.

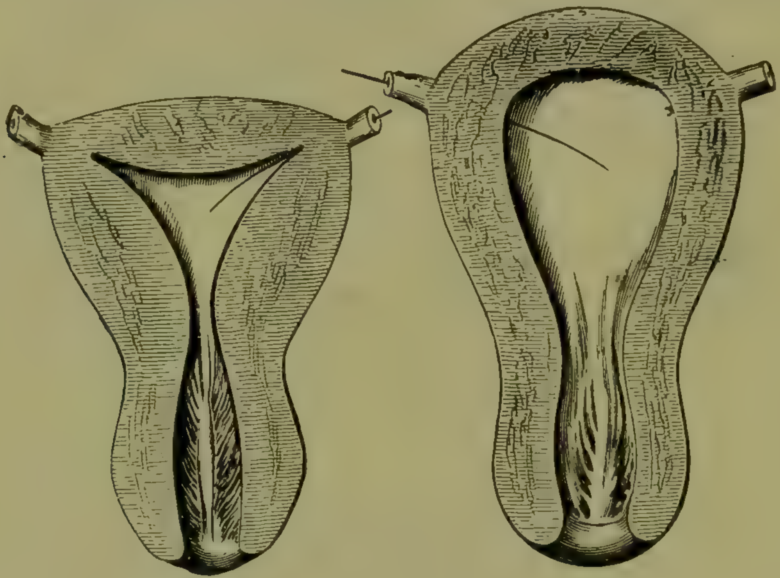

Fig. 5.—Sections of the Nulliparous and Parous Uterus.

The anterior surface of the body of the uterus is nearly flat, the posterior surface much more convex (Fig. 6 : 1, 2). The length of the uterus externally is from $2\frac{3}{4}$ to $3\frac{1}{4}$ in., its width at the fundus from $1\frac{1}{2}$ to $1\frac{3}{4}$ in., the thickness of its walls about $\frac{1}{2}$ in., the length of its cavity in the virgin uterus $2\frac{1}{4}$ in. The weight of the nulliparous uterus is from 1 to $1\frac{1}{4}$ oz., of the parous uterus about $1\frac{1}{2}$ oz.

The *cervix uteri* is divided into two portions—the vaginal and the supra-vaginal cervix. The division between them cuts the axis of the cervix obliquely, the vaginal reflection being higher behind than in front. The vaginal cervix forms a conical projection into the vagina. The supra-vaginal cervix is in contact with peritoneum behind, and with the bladder in front (*see* Fig. 2, p. 5).

The vaginal cervix is covered outside with squamous epithelium like that of the vagina. Normally, this is continued into the cervical canal for about $\frac{1}{8}$ to $\frac{1}{4}$ in., and then changes suddenly into cylindrical epithelium (Fig. 7, p. 12). There are numerous papillæ approaching the surface, but, normally, no glands. Gland cavities, however, generally occluded, are often formed under the influence of irritation, and constitute the so-called "ovula Nabothii." The external os in the nulliparous uterus is a smooth round or oval opening which feels a mere dimple to the finger. In the parous uterus it is more transverse. When lacerations have occurred, it is often cleft deeply on one or both sides, so as to divide the cervix into anterior and posterior lips.

The *cavity of the cervix* is spindle-shaped, bounded below by the external and above by the internal os. Its lining mucous membrane is thrown into complicated ridges and furrows, forming what is called the "arbor vitæ." There are median ridges on the anterior and posterior walls, and numerous oblique ridges radiating from these (Fig. 5, p. 10). The mucous membrane is provided with numerous racemose mucous glands, which open on the ridges and furrows. They are lined with cylindrical epithelium. Papillary projections exist especially near the external os (Fig. 7, p. 12). The upper limit of the arbor vitæ does not always correspond with the greatest constriction of the canal, forming the os internum. Before puberty, it extends into the body of the uterus. In the parous uterus it does not extend so high as in the nulliparous.

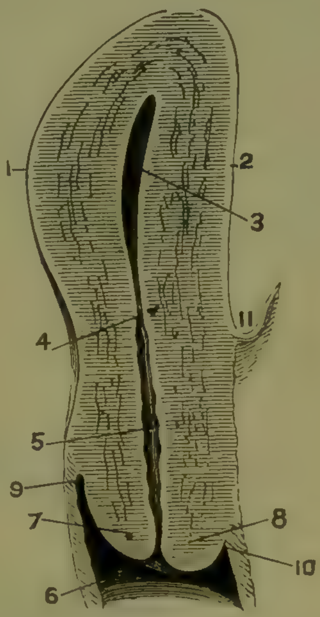

Fig. 6.—Antero-posterior Section of Uterus.

1, posterior wall; 2, anterior wall; 3, cavity of body; 4, internal os; 5, cavity of cervix; 6, external os; 7, posterior lip of cervix; 8 anterior lip of cervix; 9, posterior vaginal fornix; 10, anterior vaginal fornix.

The *cavity of the body of the uterus* is triangular, the angles corresponding to the internal os and the orifices of the Fallopian tubes. The walls are convex inwards in the nulliparous uterus. The anterior and posterior walls are in contact, or nearly so, the cavity containing only a few drops of mucus. The mucous membrane of the body of the uterus forms a soft layer varying from $\frac{1}{16}$ to $\frac{1}{8}$ in. in thickness. It is in immediate contact with the muscular wall, without the intervention of any loose connective tissue. It contains numerous glands, the utricular glands, not racemose like those of the cervix, but simple or branching ones, which run more or less nearly at right angles to the surface, but waving somewhat, so that no great length of any gland is seen on a microscopic section (Fig. 9, p. 14). The surface is covered with a simple layer of cylindrical ciliated epithelium. The epithelium of the glands is also cylindrical and ciliated, at any rate in their more superficial portions. The lumen of the glands generally becomes wider in the deeper part of the mucous membrane. The tissue between the glands is connective tissue of rather embryonic type, containing round and spindle-shaped cells, with fibrillæ amongst them.

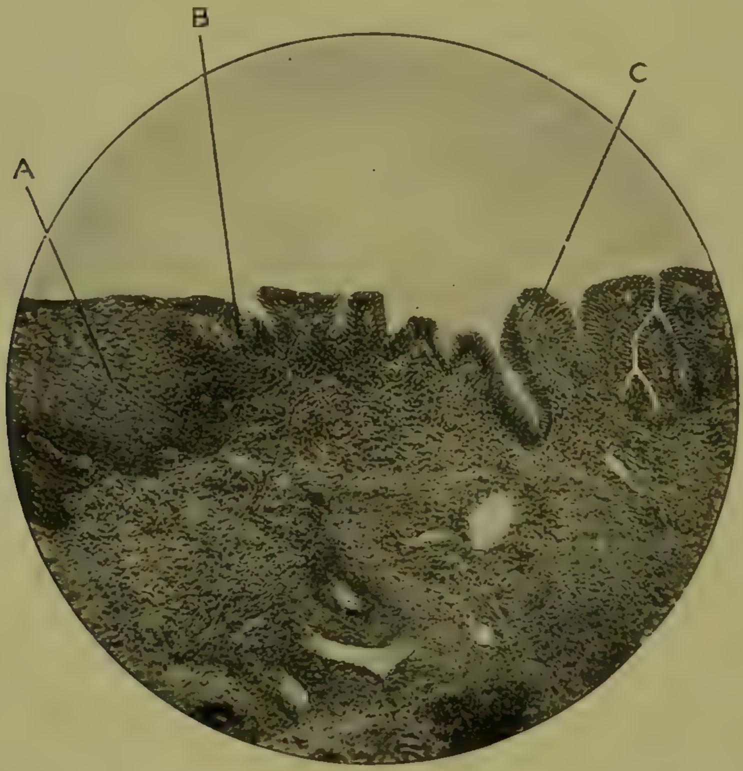

Fig. 7.—Section showing Transition from Squamous to Cylindrical Epithelium in Cervical Canal, a short distance within External Os.

A, squamous epithelium; B, commencement of cylindrical epithelium; C, villus of cervical canal.

Microphotograph by Dr. E. S. Worrall.

In the normal condition, a section shows the glands lined with regular epithelium, having a perfectly even surface, and a clear lumen, not occupied by any cellular debris (Fig. 9, p. 14)). Near the surface, the free lumen is very small; in the deeper layers it is considerably larger, and the direction of the tubes is more wavy, less perpendicular to the surface.

The muscular wall of the uterus consists of involuntary muscular fibres, which grow to a great size in pregnancy.

Amongst them is some connective tissue, and round and oval cells. Three layers of muscle are described, but are not distinct in the unimpregnated uterus.

ARRANGEMENT OF PELVIC PERITONEUM.—The peritoneum descends from the posterior wall of the abdomen, and covers the first part of the rectum and anterior surface of the sacrum. It gradually leaves the second part of the rectum, but dips down to form a pouch behind the cervix uteri, descending behind the upper half inch, or sometimes upper inch, of the posterior vaginal wall (Fig. 2, p. 5). It then ascends the posterior wall of the uterus, and forms a fold over the uterus and Fallopian tubes, reaching right across the pelvis from side to side. The parts of this fold at each side of the uterus are termed the broad ligaments of the uterus; and the whole fold has been called the mesometrium. The peritoneum descends the anterior wall of the uterus and broad ligaments down to about the centre of the uterus, corresponding with the position of the internal os. It is then reflected over the bladder, and leaving the bladder, reaches the anterior wall of the abdomen, a little above the top of the pubes. The pelvis thus contains an ante-uterine and a retro-uterine fossa of peritoneum.

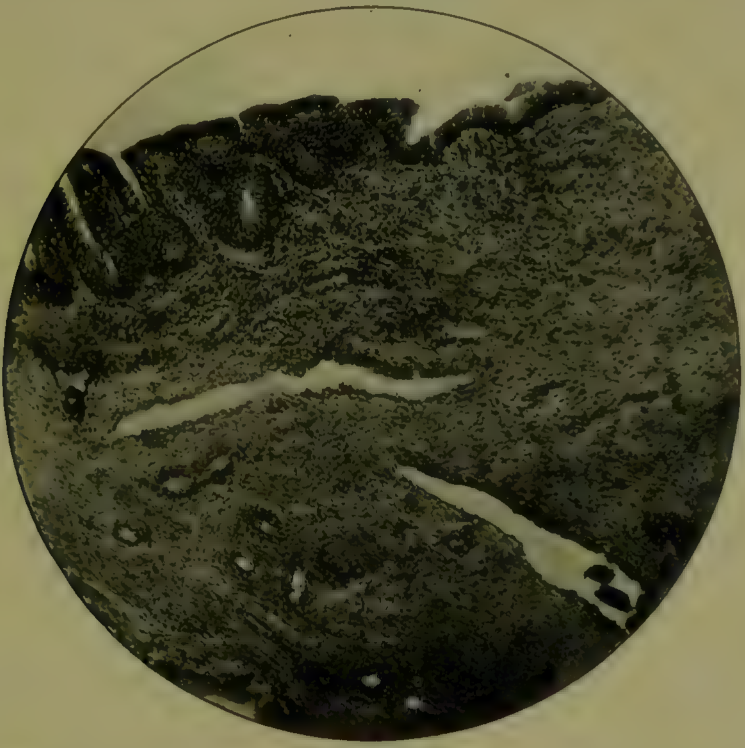

Fig. 8.—Villi of Cervical Canal. The villi are seen on the left in the direction of the external os; the more level mucous membrane on the right.
Microphotograph by Dr. E. S. Worrall.

The term "pouch of Douglas" is applied, not to the whole retro-uterine fossa, but to that deepest portion of it which lies below the centre of the uterus, and is bounded laterally by the utero-sacral ligaments, diverging from the centre of the uterus to the sides of the sacrum. Behind, it has the rectum and the anterior face of the sacrum; in front, the supra-vaginal cervix, and the upper half inch, or upper inch, of the vagina. It generally dips lower on the left side than on the right. Normally, the upper part of the retro-uterine fossa is filled by small intestines, but not the pouch of Douglas, or, at any rate, not its lower portion. Its walls are in apposition, or it contains only a few drops of peritoneal serum. When the bladder is full, or partially full, the anterior wall of the fundus uteri normally lies in contact with the bladder.

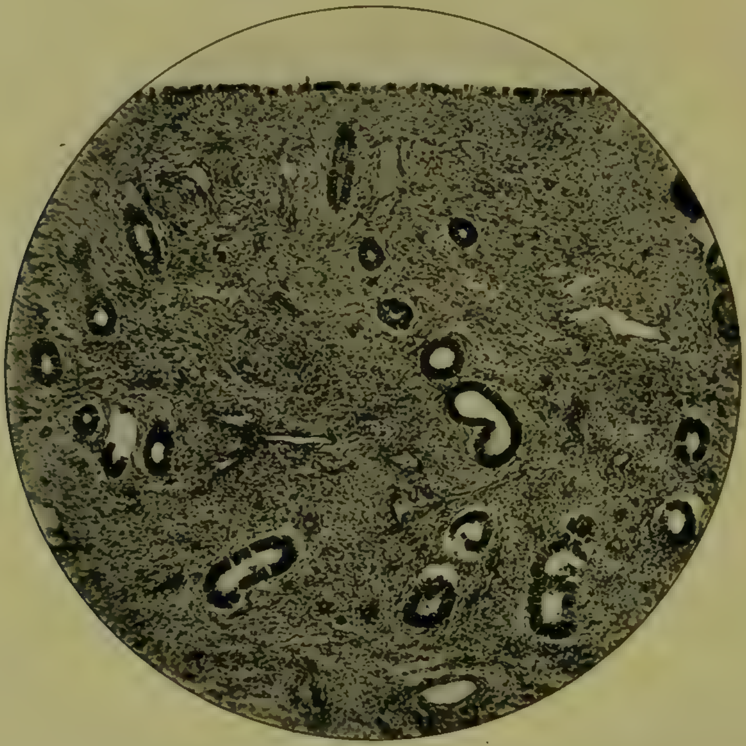

Fig. 9.—Mucous Membrane of Body of Uterus shortly before Menstruation. Microphotograph by Dr. E. S. Worrall.

LIGAMENTS OF THE UTERUS.—The formation of the broad ligaments has already been described. Each broad ligament consists of a double fold of peritoneum, with a thin layer of connective tissue intervening. It extends outward and somewhat backward from the side of the uterus to the pelvic wall in front of the sacro-iliac synchondrosis, there coming in contact with the obturator internus muscle. The layers of peritoneum separate somewhat as they approach the pelvic wall. For the greater part of its extent the broad ligament has a free and loose upper border, formed by the Fallopian tube (Figs. 10 and 11). The ovarian fimbria connects the extremity of the Fallopian tube with the ovary. This, together with the upper margin of the outer part of the broad ligament, not occupied by the Fallopian tube, is described as the *infundibulo-pelvic ligament* of the ovary.

As seen from above (Fig. 11, p. 16), the broad ligament appears to diverge into three divisions. The central is the Fallopian tube forming the free border. The anterior is the *round ligament* of the uterus (R L, Fig. 11, p. 16). This arises near the origin of the Fallopian tube, and takes a curved course outward, forward, and upward, to be inserted near the inner column of the external abdominal ring. It consists mainly of unstriped muscle, but contains also some striped muscle, and corresponds to the gubernaculum testis in the male sex.

The posterior division is formed by the ligament of the ovary passing from the angle of the uterus to the ovary itself. The ovary projects from the posterior lamina of the broad ligament, attached to it by a peritoneal fold, the mesovarium. The ovary is not covered, strictly speaking, by the peritoneum of the broad ligament, but by the modified germ epithelium.

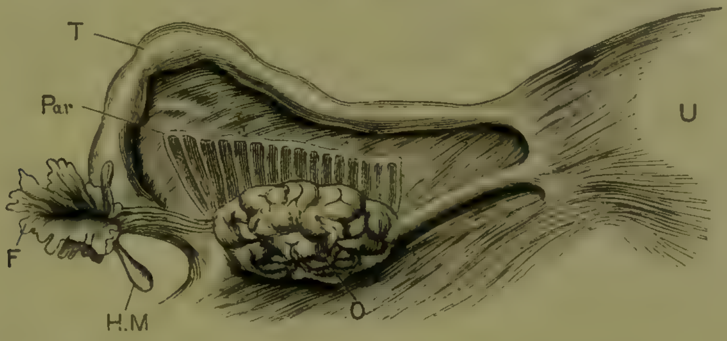

Fig. 10.—Left Broad Ligament seen from behind.
U, uterus; T, Fallopian tube; F, fimbriæ; H M, hydatid of Morgagni; O, ovary, united to uterus by ovarian ligament; Par, parovarium.

The *utero-sacral ligaments* form ridges on the posterior laminæ of the broad ligaments near to their base. On each side a fold of peritoneum—the fold of Douglas—runs from the lower part of the body of the uterus, close to the internal os, backward and outward to the second bone of the sacrum, and forms the upper rim of the lateral boundary of the pouch of Douglas. Beneath these folds are strong fibrous bands, which can be readily felt from the rectum.

If a fresh specimen of broad ligament is stretched out and held up to the light, the *parovarium*, or remains of the Wolffian body, is seen. This is shown somewhat diagrammatically in Fig. 10. The duct runs near the Fallopian tube, becoming lost as it approaches the uterus. From it straight tubes run vertically, or slightly converging, toward the ovary, and may penetrate its hilum.

In the same space, between the ovary and tube, is seen a plexus of veins, the pampiniform plexus. The broad ligament thus contains a part of the round ligament, the Fallopian tube, the ligament of the ovary, the parovarium, the uterine and ovarian arteries and veins with their branches, the pampiniform plexus, nerves and lymphatics, connective tissue and unstriped muscular fibres, the last especially on its surface. The ureter crosses its base, on its way toward the bladder. The ovary is attached to its posterior surface, without being actually contained in it.

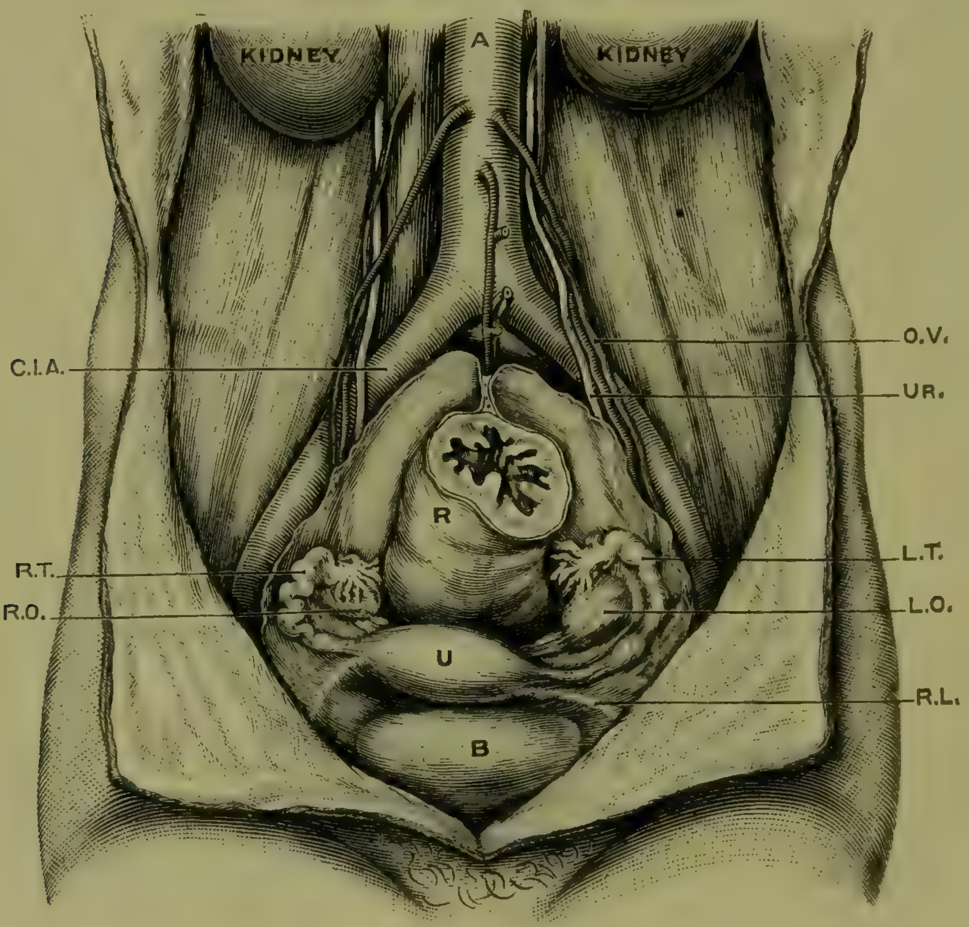

Fig. 11.—Position of Uterus and Ovaries as seen from above, with Abdominal course of Ureters.

U, uterus; B, bladder; R, rectum; R T, right Fallopian tube; L T, left Fallopian tube; R O, right ovary; L O, left ovary; R L, round ligament of uterus; A, abdominal aorta; C I A, common iliac artery; O V, ovarian vein; UR, ureter.

The broad ligaments allow considerable movement of the uterus, and in pregnancy are stretched upwards, so that their border becomes nearly vertical. The round ligaments, being muscular, draw the fundus forward, when it has been much displaced backward, as by a distended bladder, but are not usually on the stretch. The centre of the uterus at the level of the internal os is its most fixed portion, being firmly attached by the utero-sacral ligaments to the sacrum, and connected anteriorly to the pubes through the connective tissue at the base of and around the bladder. Usually the right broad ligament is a little shorter than the left, so that the fundus deviates a little to the right, and the front of the uterus is also rotated somewhat to the right. (*See* Fig. 11.)

The FALLOPIAN TUBES are two tubes, one running from each angle of the uterus, by which the uterine cavity communicates with the peritoneal cavity. They are enclosed in the upper free margin of the broad ligament. The length of each tube is about four inches; but owing to its curved position, the fimbriated extremity is not distant usually more than about two inches from the angle of the uterus. The uterine portion of the tube is the narrowest, and barely admits a bristle. On leaving the angle of the uterus it runs outwards for about an inch, its whole diameter being about $\frac{1}{6}$-inch. This portion is called the isthmus. It then becomes thicker and its lumen wider, and curves first upwards and forwards, then back-

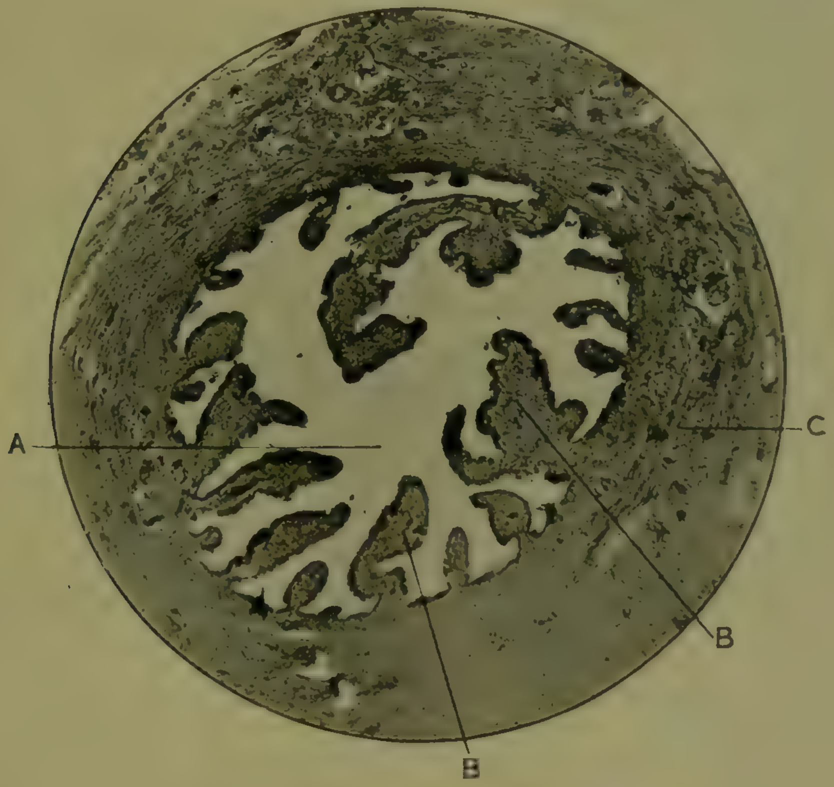

Fig. 12.—Section of Fallopian Tube.

A central lumen of tube; B sections of longitudinal folds, covered with cylindrical epithelium; C muscular wall.

wards, downwards, and finally inwards, so that it encircles the ovary, and its fimbriated extremity lies beneath it; and, in the normal position, nearer to the uterus than the centre of the tube. This shape is compared to that of a shepherd's crook (Fig. 11, p. 16). This portion is called the ampulla, and its outside diameter is about $\frac{3}{8}$-inch. The fimbriated extremity (pavilion or infundibulum) consists of bifurcating fimbriæ, radiating from the peritoneal opening of the tube. The longest fimbria, or ovarian fimbria, is attached to the ovary, and keeps the fimbriated extremity within a fixed distance from that organ. The uterus being commonly nearer to the right side of the pelvis, the right tube is often rather shorter than the left; the right ovary has its long axis more vertical than the left, and thus the right tube curves more downwards, and lies nearer to the side of the uterus than the left.

On transverse section, it is seen that about three-fourths of the circumference of the tube is covered with peritoneum. The remainder is in contact with the cellular tissue between the layers of the broad ligament, here called meso-salpinx. Next comes the muscular wall, consisting of an outer longitudinal and inner circular layer of unstriped muscular fibre. The innermost layer is the mucous membrane, which is destitute of glands, but is thrown into deep longitudinal folds, so that on transverse section a stellate opening is seen, with very small clear central lumen. These folds, by increasing the surface of mucous membrane, answer the purpose of glands. They are continuous with the fimbriæ at the ostium. Both fimbriæ and lining membrane are covered with cylindrical ciliated epithelium. The ciliæ are supposed to produce a current of peritoneal serum towards the open ostium, and in the direction of the uterus.

Development.—The Fallopian tubes, uterus, and vagina are developed from the ducts of Müller, two tubes which in the embryo run from the front of the Wolffian body to the cloaca. The lower portions unite to form the uterus and vagina; the upper portions remain separate as the Fallopian tubes. The tube has originally a cæcal extremity, which remains as the hydatid of Morgagni (Fig. 10, H.M., p. 15), attached to the fimbriæ of the Fallopian tube. The pavilion of the tube is thus an opening formed in the duct of Müller a very short distance from its cæcal extremity. Varieties in the development and coalescence of the ducts of Müller lead to certain congenital malformations.

The duct of the Wolffian body, or canal of Gärtner, normally disappears, with the exception of the relic of it which remains in the parovarium. In the early fœtus, it is seen as a canal at each side of the united Mullerian duct; occasionally parts of it may remain in the lateral walls of the uterus or vagina, and give rise to retention cysts in these situations. It is persistent in some of the lower animals, as the cow and sow.

The Ovaries lie one at each side of the uterus, attached to the posterior face of the broad ligament (Fig. 10, p. 15). The ovary is a small flattened ovoid body, its length, on an average, about $1\frac{1}{3}$-in., breadth $\frac{3}{4}$-in., thickness $\frac{1}{2}$-in. Its weight normally varies from 60 to 120 grains.

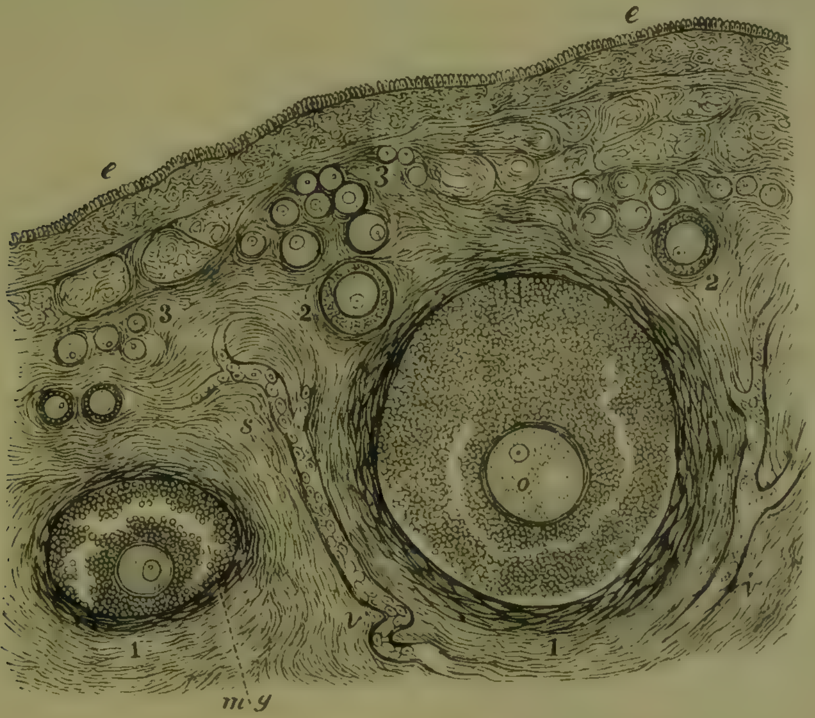

Fig. 13.—Section of Cat's Ovary.

e, epithelium; *mg*, membrana granulosa; *v*, vessel; *o*, ovule; 1, medium-sized follicles; 2, smaller follicles; 3, smallest follicles.

Ligaments.—The anterior border or hilum of the ovary is attached obliquely to the broad ligament by the mesovarium, a fold of peritoneum, through which the vessels and nerves enter. The strongest attachment of the ovary is the ovarian ligament, which runs from its inner angle to the angle of the uterus, just behind the origin of the Fallopian tube. This ligament is not liable to stretch much, and therefore causes the ovary, in any displacement, to describe the arc of a circle about the angle of the uterus. The attachment of the ovary by the ovarian fimbria to the pavilion of the tube, and thence, by the free border of the broad ligament, to the pelvic wall, is called the infundibulo-pelvic ligament of the ovary.

Structure.—The ovary consists of a connective-tissue stroma in which are embedded the Graafian follicles, which contain the ovules. It is made up of two portions—a cortical zone containing the Graafian follicles, or most of them, and a medullary zone, consisting of the stroma near the hilum, carrying vessels and nerves. The surface is covered with a cubical epithelium (Fig. 13, *e*, p. 19), different in character from the flattened epithelium of the peritoneum. The line of demarcation between the two can be seen at the hilum. A fibrous membrane beneath this is described, and termed the tunica albuginea, but is only a condensed portion of the general stroma. The smallest follicles lie close to the surface. As they get somewhat longer they lie deeper in the ovary; but as they approach maturation, their superficial part again approaches the surface, and the wall becomes thinned until it gives way (Fig. 15).

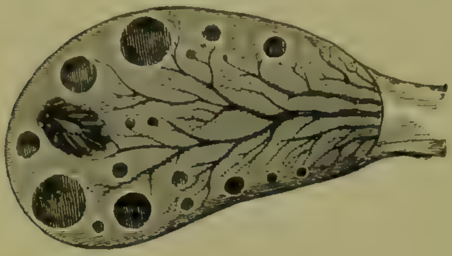

Fig. 14.—Transverse section of Human Ovary, showing Graafian follicles approaching maturation. (About twice the natural size).

The stroma consists of wavy, dense, connective tissue mingled with elastic fibres, and some unstriped muscular fibres. Besides the follicles there may be seen one or more corpora lutea of menstruation, developed from the membrana granulosa of a follicle which has ruptured, and many fibrous spots, which remain as the ultimate relic of the corpora lutea. The surface of the ovary is smooth in a child. In the adult it becomes wrinkled and scarred, from the rupture of follicles; after the menopause it becomes smaller and still more wrinkled (Fig. 10, p. 15).

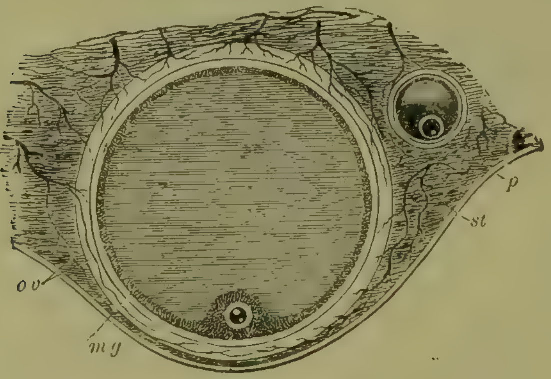

Fig. 15.—Section of two Graafian Follicles of different sizes.

p, peritoneal or quasi-peritoneal covering; *st*, ovarian stroma; *ov*, the two outer layers of the ovisac, the so-called tunica fibrosa and tunica propria; *mg*, membrana granulosa, or epithelial lining of the ovisac. Around the ovum the accumulated cells are seen forming the discus proligerus. (Enlarged about eight diameters.)

The developed Graafian follicle is generally described as having three coverings. The outer, or tunica fibrosa, consists of highly vascular connective tissue; the middle, or tunica propria, consists merely of the condensed stroma around the follicle. The inner and most important layer, lining the follicle, is the membrana granulosa, made up of rounded granular cells several layers deep. At one spot on the circumference there is a thickening of this epithelium, called the discus proligerus, in which the ovum is embedded. When the follicle is approaching maturity, it contains a relatively large space filled with clear fluid, the liquor folliculi (Fig. 15). The follicle normally reaches about $\frac{1}{4}$-in. diameter at maturity, but follicles larger than this are often seen.

The ovum itself may be regarded as a developed cell about $\frac{1}{150}$-in. in diameter, having a cell-wall, or zona pellucida, containing the yolk or cell-substance, a nucleus, or germinal vesicle, and a nucleolus, or germinal spot (Fig. 16).

Development.—Every ovule is derived from a cell of the "germ epithelium," which is a modification of the epithelium lining the pleuro-peritoneal cavity of the embryo. A thickening of this epithelium near the Wolffian body is the first trace of the ovary. Eventually those cells of the germ epithelium which remain on the surface become the cubical epithelium of the ovary, while the rest become embedded in the stroma, and form, some or all of them, the ovules. Authorities differ as to the exact process by which the ovules are embedded, and many hold that the cells of the membrana granulosa are also derived from the germ epithelium. According to Foulis the stroma grows amongst the cells of the germ epithelium, and eventually isolates every cell, except those on the surface. The cells of the membrana granulosa, according to him, are derived from the connective tissue cells surrounding the ovule (Fig. 17, p. 22). Certainly, in the human ovary, the smallest ovules appear to lie naked in the stroma, surrounded only by a few elongated cells, like connective tissue cells, and resembling those shown as surrounding the primordial ova in Fig. 17.

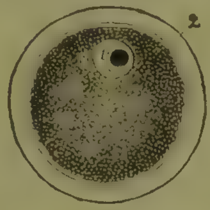

Fig. 16.—Human Ovule.
1, germinal vesicle; 2, yolk.

The Bladder and Urethra.—The bladder is in contact in front and below with the pubes—from which it is separated by a triangular space of loose cellular tissue between bladder, pubes, and urethra—behind and below with the vagina, behind and above with a portion of the neck of the uterus from the internal os to the anterior vaginal fornix, with the broad ligaments at each side. The rest of the upper surface of the bladder is covered by peritoneum. The pouch of peritoneum in front of the bladder is about the level of, or a little below, the top of the pubes when the bladder is empty. It is carried upwards as the bladder is distended.

It is also carried upwards by the stretching of the cervix uteri in labour. The shape of the empty bladder, when contracted, is ovoid or pyriform, so that it forms with the urethra a continuous tube on sagittal section. When lax, it forms with the urethra a Y shape on sagittal section, so that the fundus is concave, as seen from the peritoneal cavity (*see* Fig. 2, p. 5). When the bladder is distended, the uterus is carried bodily backward, or retroposed, and partially retroverted. In extreme distension, all the small intestines are displaced, not merely from the pouch of Douglas proper, but from the whole retro-uterine fossa of peritoneum, and the uterus is pressed back against the sacrum.

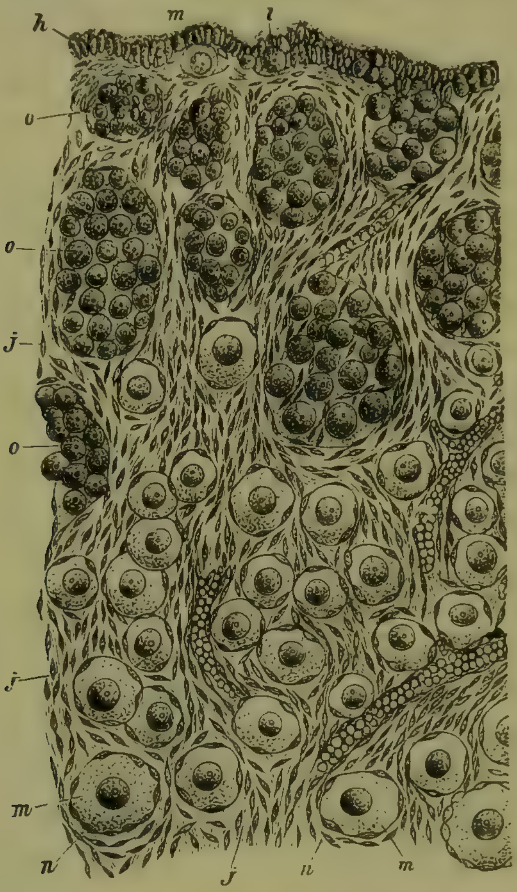

Fig. 17.—Section through the Ovary of a Human Fœtus of Seven Months.

On the surface is seen the germ epithelium (*h*); at *l* is seen a large spherical germ epithelium corpuscle; lower down groups of similar corpuscles, or egg clusters (*o*), are embedded in the meshes of the connective tissue stroma (*j*); many primordial ova (*m*), in various stages of development, are seen, chiefly in the lower part of the figure; in contact with each primordial ovum are fusiform connective tissue corpuscles (*n*), similar to the fusiform corpuscles of which the stroma consists; numerous blood-vessels ramify throughout the ovary.
(After Foulis.)

The muscular wall of the bladder consists of unstriped muscular fibres. The fibres are much interlaced, but an external longitudinal layer, a middle circular layer, and an internal longitudinal layer are described. The mucous membrane consists of several layers of polygonal or transitional epithelium, with a layer of connective tissue beneath.

The base of the bladder as seen from within has three openings —the internal orifice of the urethra, and the orifices of the two ureters. The internal orifice of the urethra bisects the distance from the meatus urinarius to the cervix uteri, each half being 1½-in. The line joining the ureters again bisects the distance between the internal orifice and the cervix uteri, the orifices of the ureters lying about ⅝-in. on each side of the middle line. The triangular space formed by the three orifices is called the trigone.

The urethra is a straight canal about 1½-in. long, its posterior wall closely blended with the anterior wall of the vagina. Its walls have a double layer of unstriped muscular fibre, the outer layer being circular. There is described also, outside these, an internal circular and external longitudinal layer of striped muscular fibre, extending from the bladder to within 1½-cm. of the meatus urinarius. The epithelial lining is squamous at the lower part, and resembles that of the bladder at the upper. There is a layer of connective tissue beneath it. The meatus urinarius opens at the centre of the lower border of the vestibule, between the vulva and vagina. Skene's glands are two tubules lying near the floor of the urethra, and extending upwards from the meatus urinarius about ¾-in.

Course of the Ureters.—In the abdominal part of its course the ureter lies on the psoas in the cellular tissue behind the peritoneum, from 1½ to 1¼-in. from the central line. It has a slight inward convexity, and a more marked convexity forward. It crosses the psoas obliquely to the common iliac artery at or just above its bifurcation, where it is about 1¼-in. from the centre of the promontory of the sacrum. A little above the middle of its course it is joined by the ovarian artery and vein, which cross it to descend into the pelvis along its outer border. (Fig. 11, p. 16). The ureter lies partly under the cæcum and ascending colon on the right, and the sigmoid flexure and descending colon on the left.

After crossing the psoas the ureter crosses the internal iliac artery obliquely at or just above its bifurcation, dropping into the true pelvis at this point. The pelvic portion of the ureter usually lies at first to the inner side of the internal iliac artery and a little in front. Occasionally it lies to the outside, and in that case it crosses in front of the uterine artery near its origin from without inward.

At the brim of the pelvis on the right side the ureter lies just behind the peritoneum, where it can be seen with the ovarian vessels. The ureter can easily be laid bare by incising the peritoneum at this point. On the left side the relative position of the ureter varies according to the length of the mesosigmoid, and the position of the upper part of the rectum. It may lie behind the sigmoid vessels, or directly behind the intestine. Just above the brim of the pelvis, as formed by the muscle, the ureter is again crossed in front by the ovarian vessels, which leave it at an acute angle to follow the upper border of the broad ligament.

From the brim of the pelvis to its entrance into the bladder wall extends the spindle-shaped portion of the ureter. It forms a bow with its concavity directed forward and somewhat inward, and is somewhat dilated near its centre. It lies in the loose cellular tissue above the levator ani muscle, and crosses the base of the broad ligament of the uterus obliquely from behind forward and inward. Where it is opposite the cervix uteri it crosses beneath the uterine artery from behind forwards and inwards at a point distant from $\frac{3}{5}$-in. to $\frac{3}{4}$-in. from the cervix. This distance is of great importance in reference to hysterectomy or supravaginal amputation of the cervix.

From this point to its entrance into the bladder wall it lies at first to the side, and then in front of the vagina, still slanting inwards. The portion of the ureter piercing the bladder wall runs for a distance of $\frac{3}{4}$-in. obliquely downward and inward. The two ureteral orifices are connected by the inter-ureteral ligament, a firm band in the bladder-wall, forming the upper border of the trigone.

The last portion of the ureter can often be palpated bimanually from the vagina. At about three-fourths of the distance from the meatus urinarius to the cervix is felt the inter-ureteral ligament as a firm transverse band. Between this and the cervix uteri the tissue is softer than the trigone. This soft tissue is bounded laterally by the ureters, felt like flattened cords or narrow tapes, diverging outward and backward. If thickened or dilated, the upper part of the pelvic ureter can also be palpated from the rectum in connection with the internal iliac artery.

Vessels of the Uterus and Ovaries.—The ovarian artery, corresponding to the spermatic artery in the male, arises from the abdominal aorta, a little below the origin of the renal artery. It crosses in front of the external iliac artery; and, on reaching the brim of the pelvis, enters between the folds of the broad ligament, near its free margin. Thence it runs tortuously toward the angle of the uterus, and gives off branches to the Fallopian tube, numerous branches to the ovary, and a branch to the round ligament. The terminal branch turns downwards near the angle of the uterus, and becomes continuous with the terminal ascending branch of the uterine artery. From this loop between the two vessels most of the branches supplying the uterus arise (Fig. 18).

The uterine artery arises from the anterior division of the internal iliac, and passes downward and inward between the layers of the broad ligament and near its base toward the cervix uteri. At a distance of $\frac{3}{5}$-in. to $\frac{3}{4}$-in. from the cervix, it crosses above the ureter. A branch to the bladder is given off considerably outside the position of the ureter. A branch to the cervix is given off generally a little outside the position of the ureter. The terminal branch then ascends between the layers of the broad ligament, a little outside the uterus, and rather toward the front of it, to unite with the ovarian artery, as already described.

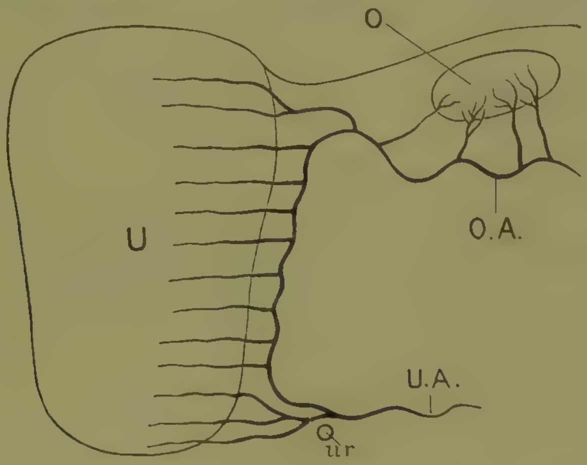

Fig. 18.—Diagrammatic representation of arrangement of Uterine and Ovarian Arteries.

U, uterus; O. ovary; U A, uterine artery; O A, ovarian artery; U R, section of ureter.

The branches of artery which supply the uterus enter the uterine wall at the side, and then divide into two branches, which encircle the uterus horizontally, at about one-third of the distance from the outer to the inner surface, uniting with corresponding branches from the other side. From these loops short branches, the "curling arteries" of the uterus, of corkscrew-like shape, run inward to the mucous membrane. This arrangement allows flexions of the uterus to occur with the least possible interference with its circulation, since each level of the uterus receives an independent supply from the broad ligament, and returns the blood by corresponding veins. On the other hand, any traction or pressure upon the broad ligaments will cause greater interference with the uterine circulation. The vaginal arteries arise from the anterior division of the internal iliac. Some branches are also derived from the uterine artery. The internal pudic artery supplies the vulva and perineum, the terminal branches going to the clitoris.

The distribution of the veins corresponds in general with that of the arteries. The veins are destitute of valves, and there are numerous plexuses freely communicating with each other. The most marked of these is the pampiniform plexus, lying between the layers of the broad ligament, in the interval between the ovary with its ligament and the Fallopian tube. The blood enters this plexus from veins coming both from uterus and ovaries, and leaves it by the ovarian vein. The right ovarian vein enters the inferior vena cava direct; the left ovarian vein enters the renal vein.

NERVES.—The nerves of the uterus and ovaries are derived mainly from the sympathetic system, united with branches of the lower lumbar and sacral nerves. The cervix and vagina are supplied from the inferior hypogastric plexuses, one at each side of the vagina. A plexus containing ganglia at each side of the vagina near the cervix and somewhat posterior to it is described as the *ganglion cervicale uteri*. The body of the uterus is supplied from the hypogastric plexus, lying over the bifurcation of the aorta and between the common iliac arteries. In connection with the ovary is the ovarian plexus derived from the renal plexus, and connected also with the nerves of the uterus. Thus the uterus and ovaries have a close sympathetic connection both with digestive organs and with the kidneys.

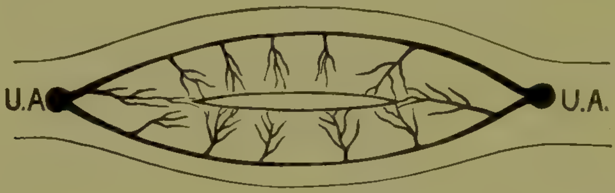

Fig. 19.—Arterial Loop supplying Uterine Wall.

U A, section of terminal branch of uterine artery, joining ovarian artery, as shown in Fig. 18. (After SIR JOHN WILLIAMS.)

LYMPHATICS.—All the genital organs, and especially the internal ones, are richly supplied with lymphatics, and hence are prone to ready absorption of any septic matter.

The lymphatics of the external genitals, and those of the lower fourth of the vagina, pass to the inguinal glands, which therefore become enlarged in syphilis and in cancer of the vulva.

The lymphatics of the main part of the vagina, of the bladder, and cervix uteri, pass to the hypogastric glands which lie in the neighbourhood of the external and internal iliac vessels, especially in front of the internal iliac vein. These are the glands most early affected in cancer of the cervix uteri.

The lymphatics of the body of the uterus, of the ovaries, and of the Fallopian tubes, pass along the broad ligaments and reach the lumbar glands. Some lymphatics are said also to pass throug the base of the broad ligament to the obturator glands, near the obturator foramen.

CHAPTER II.

MEANS OF PHYSICAL DIAGNOSIS.

Vaginal Touch and Bimanual Examination.—When a local investigation is considered desirable, the internal examination *per vaginam*, made by the index finger, or the index and middle fingers of either hand, will in most cases be the first exploratory measure which should be undertaken. It should, however, be invariably combined with abdominal palpation by the other hand placed externally over the pubes; for, if this be omitted, it is quite possible for the examiner to overlook the existence of tumours of considerable size, or of pregnancy of advanced duration.

The position of the patient is of great importance. On the Continent and in America, the dorsal position is universally adopted, while in Britain it is more common to choose the left lateral position. Each position has its own advantages. The left lateral position, combined with the introduction into the vagina of the right index finger, has the disadvantage that the sensitive palmar surface of the finger can only be turned towards the posterior and lateral vaginal walls, and not towards the anterior wall, which it is most essential to explore. It has the still greater drawback that it does not allow of any effectual use of the conjoined or bimanual manipulation. On the other hand, the lateral position allows the perineum to be more fully retracted, so that the finger can explore more deeply the posterior vaginal cul-de-sac and posterior portion of the pelvis, while its flexor surface has the most convenient direction for this purpose. The dorsal position should, generally, therefore, be employed first, but it is desirable to turn the patient afterwards into the lateral position—left, if the right hand is being used for vaginal examination, and conversely—to complete the exploration. The lateral position has the advantage in point of delicacy, the patient's face being turned away from the physician; and it may, therefore, be advisable to commence with it in the case of an over-sensitive patient.

By some it is preferred to introduce one or two fingers of the *left* hand into the vagina, while the patient is in the left lateral position. This plan allows the bimanual examination to be effectually carried out, but has the inconvenience that it requires the patient to be placed somewhat transversely on the couch or bed, and that the flexor surfaces of the fingers cannot conveniently be turned to examine the posterior half of the pelvis without changing hands.

For examination in the dorsal position, the patient should lie upon a firm, flat surface, as a hard mattress, the head, but not the shoulders, supported upon a low pillow. The knees should be flexed and abducted. When the skirts are tight, it may be necessary to slip them above the knees, whether for examination in the dorsal or in the lateral position. It is well, therefore, to have a shawl at hand, which may be thrown over the knees when required. The examining hand is then passed beneath the thigh, and the index finger, previously well lubricated,* is introduced into the vulva from its posterior aspect, the perineum being first sought for as a landmark. This is the readiest mode of at once finding the vaginal outlet, and by this means also the sensitive structures further forward, the clitoris and nymphæ, are avoided. The remaining fingers are flexed into the palm, and upon the extent to which they can be doubled back, even more than upon the length of the finger, depends the length of reach of the examiner. In most cases it is preferable to use the index finger alone at first. If two fingers are introduced, the vaginal spasm thereby excited more than counterbalances any advantage gained by the extra length of the middle finger. With a woman who has borne children, however, and whose vagina is capacious, two fingers may be used with advantage, especially in estimating the size and mobility of the uterus by the conjoined manipulation.

As it is carried up the vagina, the finger ascertains the perviousness and capacity of that canal, and also whether its mucous membrane is in a normal condition or otherwise as to smoothness, moisture, and temperature. Any undue sensitiveness or spasm at the vulval outlet is also noted as the finger enters, as well as any other abnormal condition of the perineum or the vulva itself, such as laceration or the presence of condylomata. The cervix is then examined with reference to size, hardness, position, and direction; and the os with reference to its size, the regularity, smoothness, and consistence of its lips; and the character of secretion, as to quantity and tenacity.

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* The lubricant should be antiseptic, and is best preserved and carried in a collapsable tube. Lanocreolin answers the purpose well. Perchloride of mercury dissolved in glycerine, 1 in 1,000, is often used, but being liquid, it is more apt to drop about.

In ascertaining the position and size of the body of the uterus, the conjoined manipulation is brought to aid. In the normal condition nothing can be felt of the body of the unimpregnated uterus through the posterior vaginal cul-de-sac, but a portion of it can be reached by the finger in the vagina in front of the cervix. To carry out the bimanual method, the fingers of the left hand (or of the right hand, as shown in the figure, if the physician is standing at his patient's left side), passed beneath the clothes, and laid upon the abdomen, should be pressed firmly down into the pelvis, so as to push the fundus uteri downwards and forwards (*see* Fig. 20.) They should not be applied too close to the pubes, for, in that case, the fundus is apt to be pushed backward instead of forward. The manipulation is also facilitated if the cervix be at the same time pushed backwards by the finger in the vagina. The uterus is thus brought into a position somewhat of anteversion, and can be held firmly between the fingers of the two hands, and its size, shape, and any irregularities or prominences on its surface can be ascertained with much exactness.

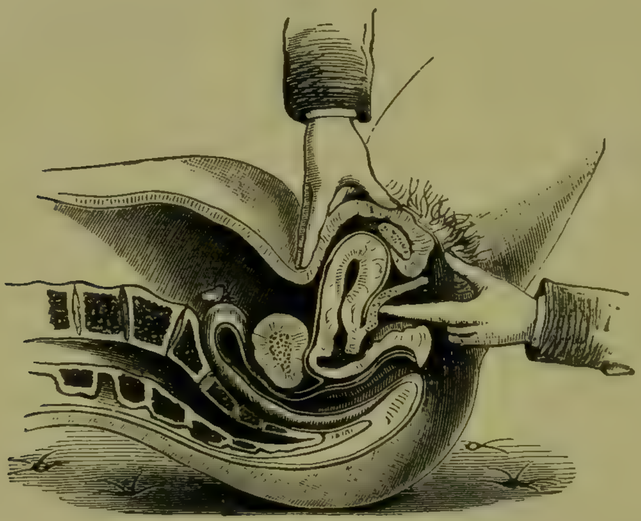

Fig. 20.—Method of Bimanual Examination. (After SIMS.)

In carrying out this manipulation, it is essential to obtain the utmost possible relaxation of the abdominal muscles by causing the patient to look up to the ceiling, with her head firmly rested upon the pillow, and by distracting her attention with conversation. If she is directed to breathe deeply, with the mouth opened, the examiner may take advantage of each expiration to sink the hand gradually deeper into the pelvis without causing painful pressure. It is essential also that the bladder should be empty, or nearly so. A full bladder is generally readily detected as an elastic, fluctuating swelling. But in any case of important or difficult diagnosis, it is well, whenever the fundus uteri is not at once seized between the internal and external fingers, to pass a catheter, and so ensure the bladder being perfectly empty. The size of the fundus can be most exactly estimated, if it is made to slip from side to side between the external and internal fingers. If the fundus uteri be absent from its normal position, the external fingers may be brought down close upon that in the vagina. In nervous patients, when the abdominal muscles are held very rigid, the full advantage of this method sometimes cannot be obtained without the administration of an anæsthetic. A thick layer of fat in the abdominal walls also interferes with it. But even in such cases, although the uterus cannot be actually felt by the external hand, it is almost always possible to ascertain approximately its size and position by observing up to what level in the abdomen an impulse can be communicated to the finger resting upon the cervix.

While the uterus is thus balanced between the two hands, it is easy to estimate the mobility of the cervix, and of the whole organ, both to upward or downward, and to lateral displacements. At the same time any undue sensitiveness, either to pressure upon the fundus or cervix, or to either form of displacement, is noted. The examiner then quits the uterus, and explores in the same manner the rest of the pelvis. While the internal finger explores deeply the anterior vaginal wall, and all the vaginal culs-de-sac, and searches for any tumour or any abnormal resistance or tenderness, the external hand, at the same moment, defines the upper limits, and ascertains the size, shape, consistence, and mobility of any mass which may thus be detected. If this can be fully carried out, it is scarcely possible for any swelling, however small, to escape detection.

The *tactus eruditus* of the observer is called most fully into play in the estimation of slight deviations from the normal standard in the mobility of the uterus, and in the resistance of surrounding parts, which may be the only trace remaining of bygone inflammation. Thus there may be much significance in a slight difference of resistance in the two lateral culs-de-sac; in a cicatricial band, running from one side of the cervix toward the pelvic wall; or in a deviation of the cervix, the fundus, or the whole uterus to one side, the result of the contraction of old inflammatory material.

In thin persons, when the abdominal walls are not too tense, the ovaries, if in their normal position, may be caught between the fingers at a point between the fundus uteri and crest of the ilium, and distant about one and a half inches from the former. The right ovary and right half of the pelvis are best explored by using the right index finger internally, the left ovary and left half of the pelvis by the left index finger. In order to feel the ovary the external hand should bring the fundus as much into anteversion as possible. The internal finger first feels the lateral angle of the fundus, and is then gradually moved toward the side. By a slight movement from behind forward it feels the ligament of the ovary as a transverse or oblique band as it crosses it. Tracing this outward, it comes upon the ovary, if lying in its normal position near the pelvic wall.

If the internal finger is in front of the broad ligament, the external hand can come down upon and feel the internal finger, with only the abdominal wall and, perhaps, bladder intervening. The examiner thus knows that the ovary lies farther back. If there is much rigidity of muscle, or thickness of fat, the ovaries can only be felt by the aid of an anæsthetic.

As a final stage, the patient may be placed on the left side, with the head and shoulders low, the knees well drawn up, and the hips near the edge of the couch. In this position the posterior portion of the pelvis can be explored most deeply by the index finger of the right hand, and this method is especially serviceable in searching for a slightly prolapsed ovary or Fallopian tube, or a small tumour behind the uterus. The physician should accustom himself to use either hand with equal facility in both positions, so that, in case of serious illness, a patient may not be needlessly disturbed.

ABDOMINAL PALPATION COMBINED WITH PERCUSSION AND AUSCULTATION.—Abdominal palpation is in many cases not required. Frequently, the bimanual touch will assure the physician of the absence of any tumour or other condition upon which its employment could throw light, and thus, if the patient is dressed, the necessity of uncovering the abdomen will be avoided. If, however, the history of a case makes it seem possible that an abdominal tumour or pregnancy may exist, it is convenient to make abdominal palpation the first step of the examination. And if the bimanual touch has revealed the existence of any tumour or swelling, or any notable enlargement of uterus, a further examination will be necessary to ascertain the shape, size, consistence, and attachments of the mass.

The examination may be made through a thin garment, but ocular inspection is often desirable to observe the appearance of the skin, the state of the veins, and the presence of any dark abdominal line. With palpation should be combined percussion —which is especially necessary for the distinguishing of phantom from real tumours, and the diagnosis of flaccid cysts or free fluid in the peritoneal cavity—and auscultation, which may reveal the sounds of a fœtal heart, the uterine souffle in pregnancy or in fibroid tumours, or friction sounds on respiration in the case of ovarian or other tumours.

Examination with the Uterine Sound.—The uterine sound is a metallic staff, marked with notches at intervals of an inch (Fig. 21), so that if, in withdrawing it, the finger be kept upon the point corresponding to the os uteri, the distance to which it has penetrated into the uterus may be at once read off. For the terminal three or four inches the diameter of the instrument should be less, so that this portion of it may be readily bent to any desired curve, but is yet firm enough to retain its shape while being introduced, and to be used, if required, for the replacement of the uterus. A suitable combination of firmness and pliability is attained if the instrument is made of pure copper, plated. The sound should terminate in a smooth, slightly bulbous extremity, which, for ordinary use, should be about one-eighth of an inch in diameter—that is to say, should just pass through gauge No. 9 of the French scale. But for use in cases of stenosis of the cervical canal, it is necessary to have a sound with a diameter not greater than one-tenth, or even one-twelfth of an inch.

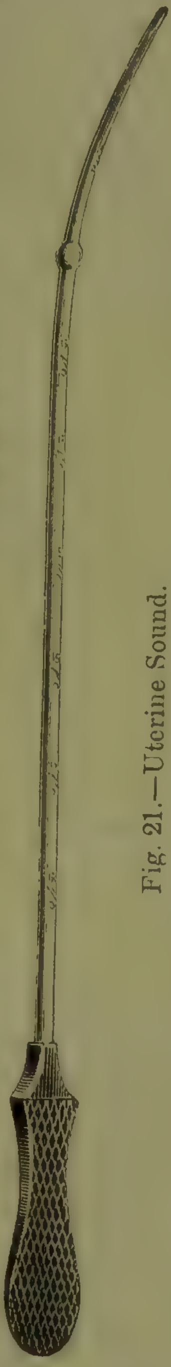

Fig. 21.—Uterine Sound.

For introduction of the sound, the patient is placed upon the left side, with the hips near the edge of the couch, and knees well drawn up. The sound should first be sterilized by boiling or by an antiseptic solution, such as carbolic acid, 1 in 20, or lysol, 1 in 50; and the hand should also have been previously disinfected carefully. There are two methods of holding the instrument during its introduction. The one which I recommend is to introduce the index finger of the right hand into the vagina, and place it upon the os uteri, while the handle of the sound is held very lightly between the thumb and one or two fingers of the left hand, so that its stem rests between the thumb and index finger of the right hand, as shown in Fig. 22.

If the vagina is moderately capacious, and the os has its normal direction, the concavity of the sound should, from the first, be directed anteriorly. The handle must at first be held well forward, close to the patient's thighs, and it is then easy, with the instrument in this position, to guide its point along the finger up to the os, and insinuate it gently into the cervical canal, and so onward to the fundus, the handle meanwhile being gradually carried backward. If, however, the vaginal orifice is narrow, and the perineum tight, as in the case of virgins, or if vaginal touch has shown that the os looks forward, instead of looking nearly in the axis of the pelvic brim, as it normally does, it is more convenient, holding the sound in the same way, to direct its concavity at first backward. As soon as it has been passed well into the vagina, in the former case, or as far as it will go into the cervical canal in the latter, its direction must be reversed by sweeping round the handle in a rather wide semi-circle, so that the stem of the instrument describes a semi-cone, while its point does not move, but its terminal portion of two and a half inches rotates nearly on its own axis. This manœuvre resembles the "tour de maitre" of a surgeon in introducing a catheter in the male, and is precisely the converse of that employed in introducing the sound into a retroflexed uterus (*see* Fig. 23, p. 35).

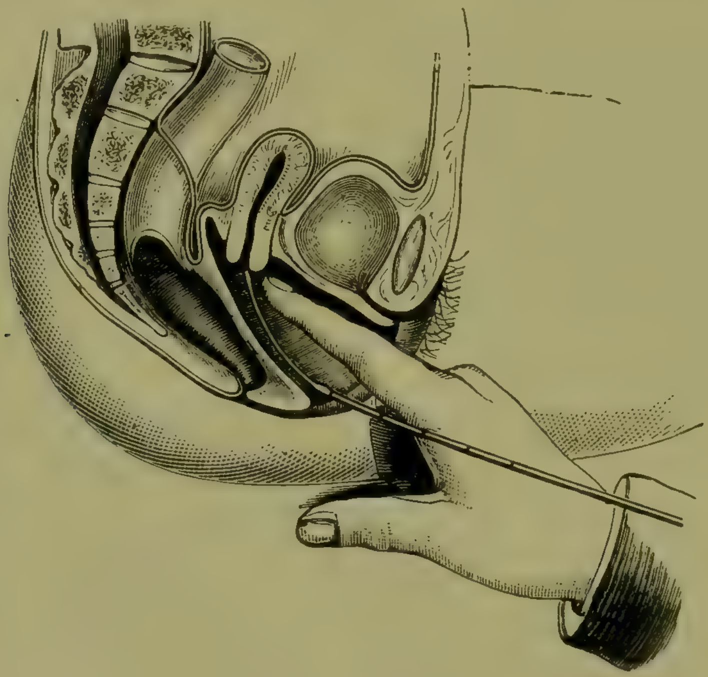

Fig. 22.—Mode of introducing Sound.

The sound is generally made with a projecting shoulder at its convex side, at a distance of two and a half inches from the end, to indicate the point which is normally just outside the os uteri, and the notches are also made upon its convex side. This shoulder interferes with flexibility, and is on the wrong side to be readily felt by the index finger of the right hand. For those, therefore, who introduce the sound in the way just described, it is far preferable to have the instrument made with a slightly prominent ring, readily felt from either side, in place of the shoulder, and to have the notches marked upon the concave side, as shown in Fig. 21, p. 33. The marks upon the sound should not be sharp notches, but shallow, smooth depressions, which can be readily cleaned, that they may not be likely to harbour any septic material. For the same reason, I think it desirable to have the figures marked only near the handle of the sound, and not on its terminal five inches. It is still better to have no figures at all (Fig. 24, p. 36), it being understood that the first notch means one and a half inches, the projecting ring two and a half inches, the remaining notches following at one-inch intervals. The sound should always be carefully cleaned and disinfected after use, as well as before.

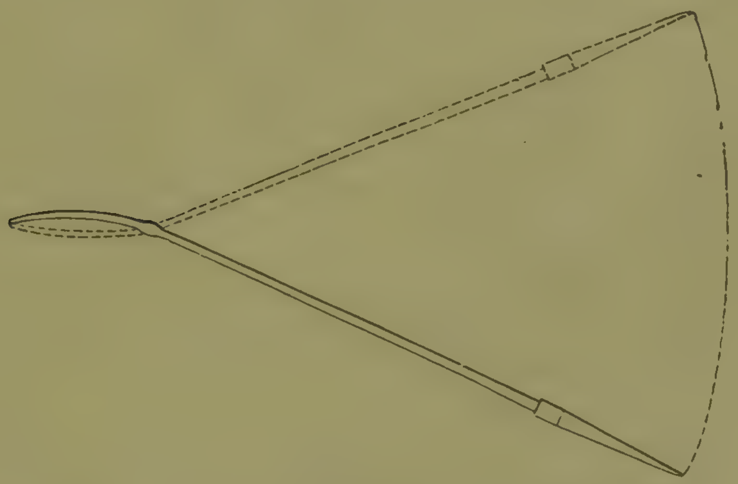

Fig. 23.—Diagram to Illustrate the Mode of Reversing the Direction of the Sound.

In the second method of introducing the sound, one or two fingers of the left hand are introduced into the vagina, and placed upon the os, while the handle is held in the right hand, the concavity of the instrument being directed forward, and the point is thus guided into the cervix. This plan has the drawback that it cannot conveniently be carried out unless the patient is so placed that her trunk is nearly transverse to the couch, a position which it is often difficult to induce women to assume. Whichever method is adopted, the physician should be able, with equal dexterity, to make use of the other hand, placing the patient upon the opposite side.

The sound should not be introduced, as a matter of routine, in every case, but only when it is likely to afford some additional information, or to clear up some point which previously remained doubtful. Its use is, as a rule, to be entirely avoided in cases of gonorrhœa or other purulent or septic inflammation of the vulva or vagina, of cancer, of acute uterine or periuterine inflammation, especially peritonitis, or when pregnancy is suspected, unless the diagnosis is of such extreme importance that it is desirable to run the risk of inducing abortion. Even in chronic periuterine inflammation, it should be used only exceptionally, and with great caution. In all cases the direction of the uterine cavity should be previously ascertained, as far as possible, by bimanual touch, and the instrument should be warmed, that it may not, by its coldness, excite spasm of the cervix. If any great flexion of the uterus has been detected, the sound should first be bent to a corresponding curve, and its concavity turned in a suitable direction.

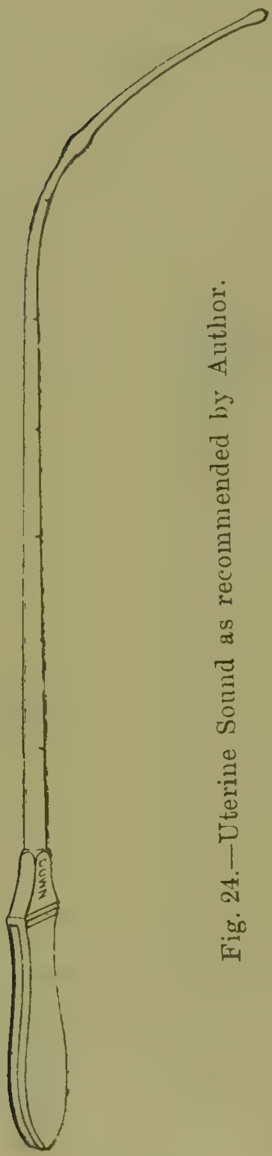

Fig. 24.—Uterine Sound as recommended by Author.

The first object in the use of the sound is *to measure the length of the uterine cavity.* It any obstacle be met with, it should be overcome by changing the direction of the point, or by very gentle and prolonged pressure, to which any temporary muscular spasm will gradually yield. It is to be remembered that a slight hindrance frequently occurs at the internal os, and that the point of the sound is often arrested there in consequence of flexion, especially anteflexion, or, much more rarely, in consequence of stenosis. Some pain is often felt as the sound passes the internal os, and frequently a sudden pain indicates the moment when the point has reached the fundus, which is more sensitive than other parts, and may be excessively so in metritis or endometritis of the body of the uterus.

A second object is *to learn the direction and course of the uterine* *cavity.* In this respect the information to be gained is as positive as that which an autopsy could afford, and it is by verifying by the sound the inferences deduced from the vaginal and bimanual touch that the physician is best able to acquire the necessary *tactus eruditis.* The conditions in which this indication is most important are when there are tumours near the uterus, which might be mistaken for its fundus, when the uterus is embedded in inflammatory exudation, so that its position cannot be made out by palpation, or when it is distorted by fibroid or other tumours in its substance.

A third object is *to ascertain the permeability and diameter of the uterine canal.* The mode of doing this will be described under the head of stenosis of the cervix. Valuable information is also obtained as to the *sensitiveness of the internal surface of the uterus at its different parts*, but for this purpose the sound must be used with much caution. A further application is *to decide upon the presence or absence of any foreign body*, such as a retained ovum, polypus, or other tumour in the cavity of the uterus, and to determine its attachments. The sound will also detect any *roughness, ulcerated cavity, or prominence* in the uterine walls. For this purpose the point must be carefully passed from above downward over both walls, as well as from side to side. For *testing the mobility of the uterus*, bimanual touch is generally sufficient, but the sound may be used to great advantage to determine how intimately the uterus is connected with an ovarian or other tumour. In the case of fixation by inflammatory adhesions alone, the use of the sound as a test of mobility is not without danger, and other means are then generally sufficient.

The use of the sound *in conjunction with external palpation* is sometimes of great value, especially when the body of the uterus cannot be defined by the bimanual touch alone, or when it is required to distinguish it from other masses felt in the abdomen, and ascertain its connection with them. For this purpose the right hand may be chosen most conveniently for external palpation, and the left for holding the handle of the sound, while the patient remains on the left side. In some cases of difficulty, however, it is preferable to place her in the dorsal position. The handle of the sound being slightly rotated, the external hand detects the corresponding movement imparted to the fundus, and observes whether any other masses in the abdomen move with the fundus or not.

That the utmost gentleness is necessary in introducing the sound is shown by the fact that it has not very infrequently penetrated a soft uterus, so that its point could be felt beneath the abdominal wall. In some cases it may have passed along a dilated Fallopian tube, but there is no doubt that more frequently it has actually pierced the uterine wall, and sometimes an aperture has remained, through which it could be repeatedly passed. In most such cases no serious symptoms have followed, but the occurrence is not to be regarded as altogether without danger. It is most likely to occur when the uterus is softened by degeneration after parturition or abortion, or by the presence of cancer, or when its wall is extremely thin from super-involution.

The use of the sound for *replacement of the uterus* will be described under the heading of displacements of that organ.

Many American authorities have followed Marion Sims in recommending as safer than the sound the uterine probe (Fig. 25), which is only a little larger than the ordinary surgical probe, and is perfectly pliable, being made of pure silver or copper. This is used through a Sims' speculum, and the physician gives it the curve which he supposes the uterine canal to have, and keeps altering the curve, if necessary, until he can pass it without using the slightest force. This method has the drawback that the position of the uterus may be modified to an unknown extent by the introduction of the speculum, and the evidence derived from the probe thus rendered fallacious. Moreover, there are some cases of flexions in which there is great difficulty in passing the sound, and in which the operator may derive much assistance from lifting up the fundus with his finger, and so partially straightening the uterus, making due allowance in his mind for the change in its position so produced. This assistance is sacrificed by the use of the speculum, although there is some compensation in the fact that the cervix may be drawn downward or forward by a tenaculum. The dimensions of the vulva limit too much the movements of the handle of the probe to allow it to be passed through a speculum in a case of extreme flexion, the flexion remaining unreduced, while a properly made sound can be

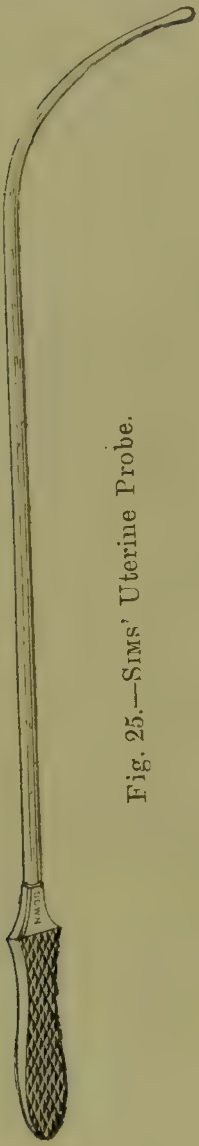

Fig. 25.—Sims' Uterine Probe.

equally well bent to any desired curve. Again, when the vulva is at all narrow, and especially in the case of a virgin, the passing of a uterine sound by a skilful hand generally gives the patient far less discomfort than the introduction of a Sims' speculum.

Rectal Touch.—In the case of tumours or inflammatory thickenings behind the uterus, the rectal touch is often the most valuable of all modes of exploration. The finger can reach *per rectum* to a higher level than *per vaginam;* the magnitude of any swelling, and its relation to the recto-vaginal septum and the posterior pelvic wall, can be accurately determined, and the ovaries can often be very exactly made out, as well as the Fallopian tubes, if these are thickened or distended.

The patient may be placed in the dorsal position, and the method combined with abdominal palpation, but for exploration of the posterior and lateral walls of the rectum, the lateral position is preferable. If the patient be directed to bear down as the finger is passing the sphincter, less discomfort is caused by its introduction. In the case of virgins with a very small hymeneal aperture, rectal may replace vaginal touch as a means of ascertaining the condition of the uterus, but as a general rule rectal proves much more disagreeable than vaginal exploration. An inexperienced person may be somewhat puzzled in recognising the cervix uteri as felt *per rectum*, but if the thumb be passed into the vagina, while the index finger is introduced into the rectum, the patient being in the dorsal position, the results of vaginal are at once brought into association with those of rectal touch. The uterus may also be grasped between the thumb in the vagina, and one or two fingers in the rectum, if the fundus is at the same time pushed down by the external hand. Rectal examination may be used in conjunction with a sound in the uterus to determine the connection of retro-uterine swellings with that organ, or in conjunction with a vesical sound in the bladder, in the case of absence or atresia of uterus or vagina, or to distinguish between a polypus and inversion of the uterus.

The scope of rectal exploration has been greatly extended by the method introduced by the late Professor Simon, of Heidelberg—namely, to place the patient under an anæsthetic, and introduce four fingers, or the whole hand, and, if necessary, a portion of the forearm into the rectum. Two or three fingers may even be passed into the commencement of the sigmoid flexure, and it is possible thus to reach as high as the lower portion of the kidneys. This method, when carried to its fullest extent, is not without danger, and has occasionally led to a fatal result. It should only be employed to establish a very important diagnosis as to the nature and connections of a tumour. As far as regards structures within the pelvis, which can be reached by two fingers, the presence of the whole hand within the rectum generally rather impedes than facilitates the delicacy of touch.

Certain special expedients, to aid the combination of vaginal and rectal touch with bimanual examination, are of use in difficult cases, particularly for making out the attachments of a tumour. Thus, if the vagina is not sufficiently capacious, it may be stretched by preliminary plugging, or the use of an air-ball pessary. Another expedient is to place the patient on the left side, seize the cervix with tenaculum forceps and draw it down as far as is possible without using undue force. The handles of the forceps being then given to an assistant to hold, one or two fingers of the left hand are introduced into the rectum, while the right hand, used externally, helps to push down the fundus if no tumour intervenes. In this way the pedicle of a tumour, or band of adhesion, may often be put on the stretch and so detected. The fingers in the rectum may also by this method reach as high as the fundus, and any fault of development may be exactly made out. Hegar, who specially recommends this method, uses simple bullet forceps, having a catch at the handle, to draw down the cervix. The uterine tenaculum forceps shown in Fig. 26 give a more secure hold, the smaller arm of the forceps being introduced within the cervix. To carry out this plan effectually, anæsthesia is generally necessary.

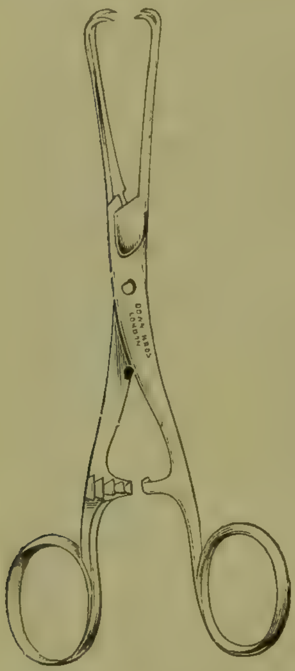

Fig. 26.—Author's Uterine Vulsellum.

Exploration of the Bladder.—In a gynæcological examination it may be desirable to empty the bladder by catheter, or to pass a bladder sound, in order to test whether the uterus can be felt in its normal position between the sound and a finger in the rectum. The student should acquire dexterity in performing either operation by the aid of touch alone.

A silver or glass catheter has the advantage that it can be more readily sterilized by boiling, but a celluloid or gum-elastic catheter may be immersed for a minute or two in boiling water. If a male gum-elastic catheter is used care must be taken not to push the instrument too far into the bladder. In general, a male gum-elastic catheter may be used with quite as much advantage as the silver female catheter, care being taken not to run the risk of injuring the posterior bladder-wall. In some cases when the urethra is distorted, as by the presence of tumours, the rigid catheter has an advantage, from the fact that its course can be more precisely directed.

The use of the catheter, especially if frequently repeated, is always liable to set up cystitis, doubtless due to the conveyance of microbes to the bladder. Care should be taken, therefore, that the catheter is perfectly clean, and previously sterilized by boiling, or by a powerful antiseptic. The hands should be disinfected before using it, and the vulva in the neighbourhood of the meatus wiped clean with an antiseptic solution, such as lysol, 1 in 80. Of catheters other than glass or metal the best form is one which is solid beyond the eye, so that there is no cul-de-sac to retain dirt, or else one with an open end instead of an eye.

Mode of passing Catheter.—To pass the catheter, the patient should be placed in the dorsal position, with the knees flexed. A long elastic tube may be fitted on to the catheter, in order to conduct the urine into a vessel under the bed. It is generally preferable, however, to have a small vessel close at hand, for the physician can then instantly perceive as soon as the urine begins to flow, and thus be warned that he has passed the catheter far enough. A full-sized catheter, from No. 10 to No. 12, should be chosen, for the point is then less likely to catch in any depression of the mucous membrane. The guide for finding the meatus is the apex of the pubic arch. Supposing the physician to be standing at the right side of his patient, he passes his right hand beneath the thigh, and his left hand, holding the catheter, above the thigh. With the index finger of the right hand he first finds the perineum, and then introduces the tip of the finger just within the vagina—that is to say, within the circle of the hymen, if there is one existing. The urethra can then be felt as a cord against the apex of the pubic arch. The tip of the finger is slightly withdrawn to the extremity of this cord, and feels, just in front of it, the orifice of the urethra as an obvious depression. The catheter being still held in the left hand, its point is then guided into the orifice. If the upper part of the urethra or neck of the bladder is pushed forward above the pubes, as by a tumour, or by the presence of the fœtal head, it is often useful, as the catheter passes onward, to direct its point upward, through the medium of the urethral wall, by the finger passed into the vagina.

DIGITAL EXPLORATION OF THE BLADDER.—The anterior surface of the uterus and ovaries, and of any tumour in connection with them, may be very immediately reached by passing the finger into the bladder, after rapid dilatation of the urethra. For this purpose a three-bladed urethral dilator, the metallic bougies used for dilatation of the uterine canal, Hegar's uterine dilators, Goodall's uterine dilator, or Bryant's urethral speculum dilator may be used. One of the expanding dilators appears to be the least likely to cause laceration. An anæsthetic is administered, and the urethra is then stretched by means of the dilator, until first the little finger, and afterwards the index finger, can be introduced. If necessary the margins of the meatus may be slightly incised as a preliminary step. Some cystitis may be set up, and long-standing, if not permanent, incontinence of urine has occasionally followed: the plan, therefore, should only be adopted in order to make a diagnosis of great importance as regards the condition of the uterus. It is more frequently called for to ascertain the presence of growths or other diseased conditions in the bladder itself. As a rule, there is no permanent, and rarely even temporary, incontinence if the urethra be not dilated beyond the size of a moderately slender index finger.

THE SPECULUM.—The use of the speculum is less important for diagnosis than to facilitate the application of remedies and the introduction of instruments, as in the operation for the cure of fistulæ. In diagnosis, it serves chiefly to reveal the appearance of the cervix, especially as to the presence or absence of any erosion, granular inflammation, growth, ulceration, or adenomatous hypertrophy, the character and abundance of the secretion issuing from the os, and also the condition of the vaginal walls. Thus a small soft mucous polypus may often escape the notice of an examining finger, if not very expert, but is at once visible in the speculum. Out of all the numerous varieties of specula there are four of special value, and of these each has such distinctive merits that three, at least, of them are essential to the gynæcologist for use under different circumstances.

Ferguson's Tubular Speculum.—The speculum which concentrates far more light than any other upon the os uteri, and one which commonly brings the cervix readily into view, is Ferguson's speculum of silvered glass with bevelled extremity, and trumpet-shaped entrance, whereby the rays of light are concentrated (Fig. 27). It has the further advantage that it is readily cleaned, and is unaffected by acids or other fluids, while its sides protect the vagina from any application used, and a considerable quantity of fluid can be conveniently poured into it, if such a mode of application is desired. These specula can be obtained of toughened glass, whereby the objection of fragility is, in great measure, obviated. A similar speculum which affords an almost equally good illumination is made of porcelain lined with a reflecting surface of platinum. This has the advantage that it is not liable to be cracked by hot water as the glass is, and never forms any cracks at the edge to harbour septic material.

For the introduction of the cylindrical or bivalve speculum, it is more usual in Britain to place the patient in the lateral, or, what is better, the semi-prone position. This has the advantage in point of delicacy, but it is open to the drawback that it requires a nearly horizontal light, such as is not easily obtained in a ground floor room, and that the patient's legs, feet, and dress are apt to interfere with the illumination. The dorsal position has the great advantage that the effect of gravity then tends to bring the axis of the uterus more nearly into coincidence with that of the vagina, and so facilitates the exposure of the os. It should always be adopted, therefore, if any great difficulty is found in bringing the os into view, especially when this is due to anteversion of the uterus. If the uterus be retroverted, the lateral position often answers better, since the tip of the speculum can then be more easily directed forward to find the cervix.

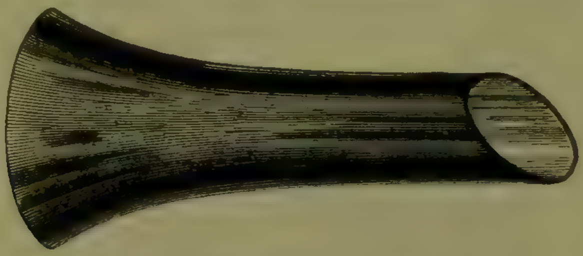
Fig. 27.—Ferguson's Speculum.

In either case the speculum is introduced without exposure of the patient. The position and direction of the cervix are first ascertained by the index finger; then by two fingers the labia are separated and perineum retracted so that the bevelled tip of the speculum can be passed beneath it. The speculum is then gradually pushed on in a backward direction, stretching the perineum still further back, while any painful pressure on the sensitive structures on the anterior wall of the vulva is avoided. The direction finally given is regulated by the position of the cervix as previously ascertained. If the os does not at once come into view, the speculum must be drawn back somewhat, and again pushed on in a different direction. Not infrequently, when the uterus is anteverted, only the anterior surface of the cervix and anterior lip of the os are fully brought into view in this way, the whole circuit of the os not being fully seen. This difficulty may often be overcome by rotating the speculum till its projecting tip is anterior, in which position it tends to push up the fundus. Another plan is to draw the os into the centre of the field by means of a tenaculum hook, or by the sound passed just within the cervix. If this fails, the best plan is to use a bivalve or Sims' speculum.

A Ferguson's speculum should be cylindrical in its vaginal portion, not conical, as they are sometimes made. The conical shape contracts the field of view, and renders the speculum more liable to be forced out by a contractile vagina. Ferguson's specula are sometimes made of metal, but this does not reflect light so well as the materials above described.

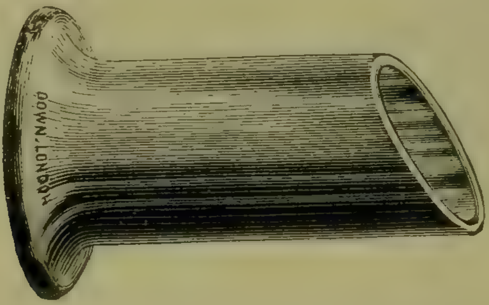

Fig. 28.—Short **Ferguson's** Speculum.

A Ferguson's speculum is generally made about six inches long, and, when the vagina is long, or the woman very fat, some such length as this is necessary. For many purposes, however, a short Ferguson's speculum of full diameter has great advantages over a longer one, and it is well to have such an instrument in addition (Fig. 28). It should be barely 4 inches long on the longer side, and $3\frac{1}{8}$ inches on the shorter, the bevelled end being less oblique than usual, the external diameter about $1\frac{1}{2}$ inches. The outer end should have only a moderate rim, not a wide, trumpet-shaped expansion. There are two special advantages in such a short speculum. First, it allows any point of the cervix to be felt through the speculum. This is very useful for guiding the bistoury or needle to distended cervical glands, which are often much more readily felt than seen. Secondly, by the lateral stretching of the vagina, it draws the cervix nearer the outlet, instead of pushing it farther away, and, in consequence, a probe for intra-uterine medication can be much more easily passed into the canal, than with a longer speculum. This may, indeed, be done still more advantageously with Sims' speculum, but over that the short Ferguson's speculum has the great advantage that no assistant is required. Even for ordinary use, in the smaller sizes, a speculum not more than about 4½ inches long on its longest side is more convenient than a longer one in the majority of cases.

For illumination direct daylight is far superior to anything else, and, if the patient be in the dorsal position, a descending light, if the angle with the horizon be not greater than about 45°, answers excellently. If direct daylight cannot be obtained, it is often convenient to use a concave mirror, similar to a laryngoscopic mirror, having a rather large central aperture cut quite through the glass, and mounted upon a handle. This may be used to reflect either daylight or the rays of a lamp. A small electric lamp, mounted on a curved handle, is still more convenient when artificial light is required. If mounted upon a spectacle frame it has the further advantage that it leaves both hands free.

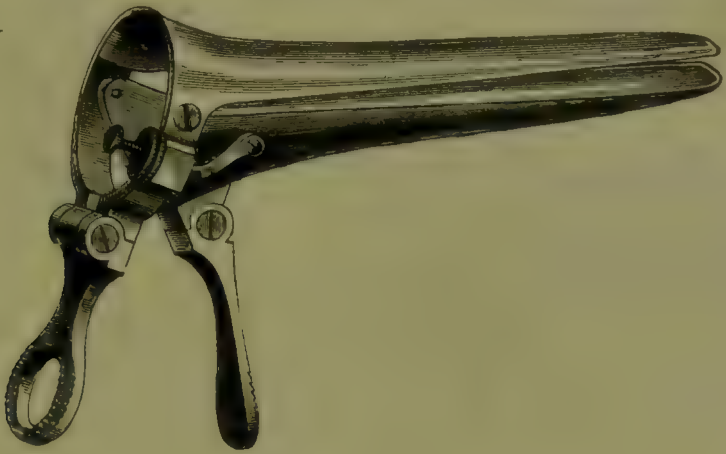

Fig. 29.—Cusco's Bivalve Speculum.

The Bivalve Speculum.—Of all valvular specula, the best is Cusco's bivalve speculum (Fig. 29). It is very easily introduced, and, in some respects, is the most convenient of all specula, especially in the fact that it is perfectly self-retaining. Its successful action depends upon a correct mode of introducing it. It is essential to ascertain first with the finger the exact direction and distance of the os. The speculum is tilted sideways to pass the vulva, then turned so that the blades are antero-posterior, and pushed on till their extremities are a little short of the os, but exactly in its direction, special care being taken that they do not pass beyond it into either cul-de-sac. The blades are then opened by the handles, the effect of which is that the fundus is pushed up by the anterior blade, and the antero-posterior stretching of the vagina at the same moment draws the cervix downward and forward, so that the axis of the uterus is brought nearly into coincidence with that of the vagina. The lips of the os are also drawn somewhat apart, so that the interior of the cervical canal can be seen. As soon as the os is fully in view, the speculum is at once fixed by the screw at the side. In another form of the instrument the blades are expanded at once by a screw passing through the handle.

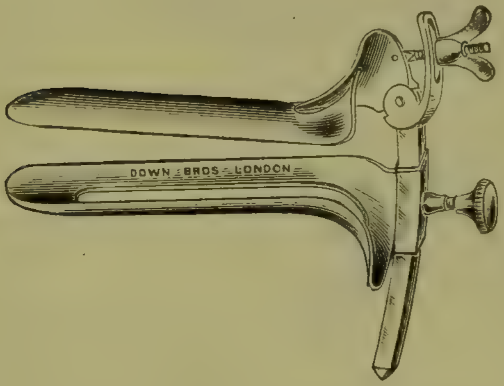

Fig. 30.—Jackson's Bivalve Speculum.

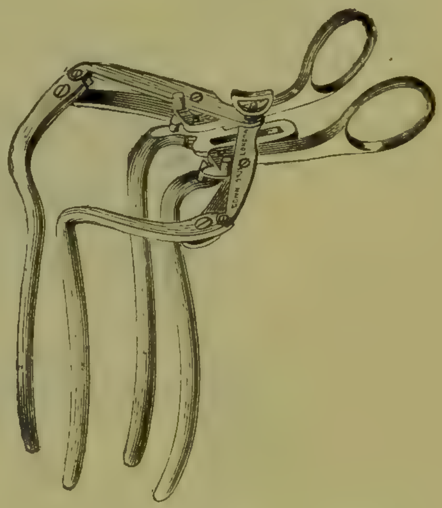

Fig. 31.—Allingham's Speculum.

The essential points in a good speculum are that the blades should be capable of wide separation, and that they should themselves be wide enough to prevent the lateral vaginal walls encroaching on the field of view (for which purpose a width of about $1\frac{1}{2}$ inches near the extremity is desirable). To be suitable for use with a vagina of any length, the length of each blade should be about $4\frac{1}{2}$ inches. But, when the cervix uteri is at its ordinary level, and there is no excess of external fat, a shorter speculum has the same advantage which the short Ferguson's speculum has over the longer one (*see* page 44). Such an instrument should have each blade about $3\frac{3}{4}$ inches long. The blades should never be placed laterally, for then the natural tendency of the vagina to become flattened antero-posteriorly causes its walls to encroach upon the field of view. The handles may be turned either toward the perineum or toward the pubes, as is most convenient. In withdrawing the speculum, care must be taken not to allow the blades to close completely, and thereby pinch the vaginal walls.

All the modifications, or so-called modern improvements, of valvular specula, in which three or four blades are employed, or the anterior blade is made much shorter than the posterior, interfere with this mechanism of bringing the uterus into a position of slight retroversion, and so do away with the special advantage of this form of speculum. There are, however, some useful, but more complicated, modifications of the bivalve speculum, in which the blades can be separated at their bases as well as at their extremities, so as to dilate the vulva, and give a wider entrance to the field of view (Fig. 30, p. 46). The only four-bladed speculum which produces some degree of the same antero-posterior stretching of the vagina as a bivalve speculum, but combined with lateral stretching, is Allingham's, which forms also a very good rectal speculum, Fig. 31, p. 46. This has the advantage that it gives a view of almost the whole of the vaginal walls at once, as well as of the cervix; and it allows a wide expansion in all directions, while it folds up very small.

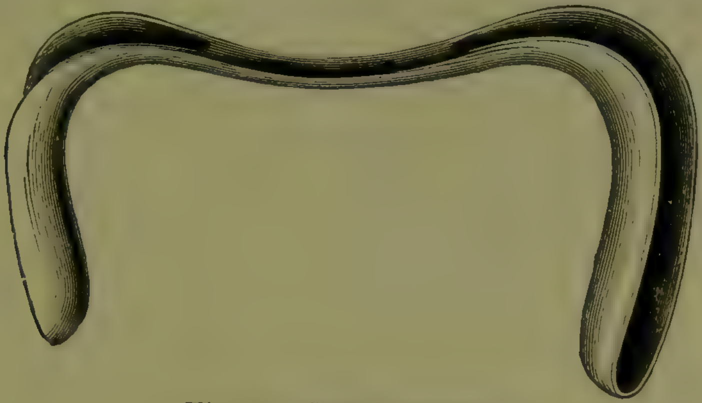

Fig. 32.—Sims' Speculum.

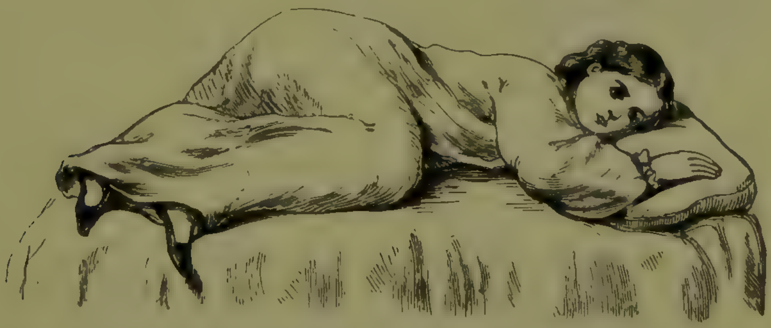

Fig. 33.—Position for introduction of Sims' Speculum. (After Sims.)

Sims' Speculum.—Sims' univalve speculum (Fig. 32) is far superior to all others for many purposes, as when it is desired to introduce a tent or probe through the speculum, or to operate upon the cervix or vaginal walls. Its drawback is that it cannot be employed without an assistant, while a skilled assistant is necessary to give its full value. The most important element in the use of this instrument is the position of the patient.

To get the full benefit of the speculum, all dresses fastened round the waist should be loosened, as a preliminary step. The patient is placed on a high and firm couch, or table, and the light must be nearly horizontal. She lies on her left side, in a semi-prone position, with the head and shoulders low, and the left arm drawn behind her, so that the sternum is rotated forwards, coming very nearly into contact with the table. The legs are flexed at right angles to the trunk, and the right rather more than the left, so that the right knee lies just above the left, in contact with the table (Fig. 33, p. 47). The nurse or assistant stands behind her, and pulls up the right side of the nates with the left hand. The physician then introduces the speculum, guiding it with the finger into its position, behind the cervix, draws back the perineum so as to convert the vagina into a straight canal, and gives the instrument into the hand of the assistant, who holds it firmly in the desired position, maintaining the retraction of the perineum. In any long operation the hand of the assistant is apt to become fatigued, and therefore unsteady. Steadiness will be promoted if he can keep the speculum in position by fixing his hand as a wedge between its handle and the patient's sacrum, instead of depending solely upon muscular effort.

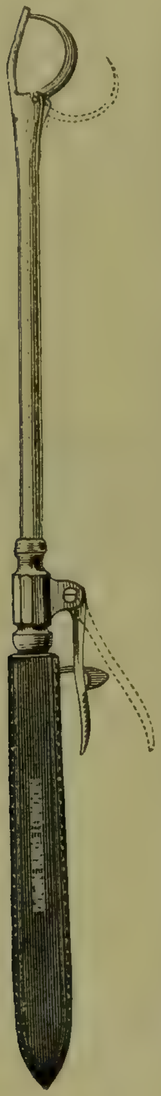
Fig. 34.—Chambers' Uterine Tenaculum.

The object of this position is to make the vulva the highest point of the vaginal canal, and allow the effect of gravity on the abdominal viscera and walls to draw the anterior vaginal wall forward, and expand the canal into an air-containing cavity, almost as effectually as if the patient were in the knee-elbow position. When, however, the vagina or vulva is narrow, the anterior vaginal wall does not fall away sufficiently to allow the os to be seen, and it is then necessary to push it back, either by the finger, or by a sound or similar instrument, or by a depressor made for the purpose. This tends to draw the cervix forward. If, however, the cervix is still directed too much backward to expose the os fully to view, or to bring it into a convenient position for the introduction of a probe or other manipulation, a small tenaculum hook (Fig. 35) is to be fixed in the anterior lip of the os. By this means the cervix is drawn forward until it is nearly in the axis of the vagina (*see* Fig. 44, p. 55). This measure causes very little pain or inconvenience, and the shank of the hook serves at the same time for a depressor of the anterior vaginal wall. A more secure hold of the anterior lip is given by the form of tenaculum shown in Fig. 34, or by the author's tenaculum (Fig. 26, p. 40). Various modifications of Sims' speculum have been invented with the object of attaching to the instrument a sacral plate and depressor, and thereby rendering it self-retaining, dispensing with the need of any assistant, and leaving the operator's hands free. Another convenient modification is that shown in Fig. 36, p. 50, in which the blade of the speculum is split, and can be expanded by a screw, according to the size of the vagina and the amount of space required.

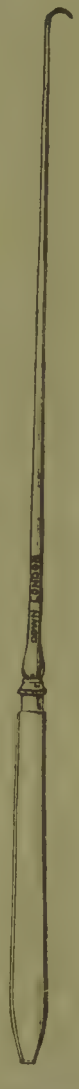
Fig. 35.

The small blade of this instrument may be used for a small vagina, or as a rectal speculum. In the form shown in Fig. 37, p. 51, the second blade is short and square ended, the form which is most convenient for all operations in which it is necessary to draw down the cervix, because the short blade does not hinder the depression of the posterior fornix which is necessary to allow the cervix to come down to or outside the vulva.

Another position in which a Sims' speculum may be used is the lithotomy position, or, still better, the exaggerated lithotomy position, in which the pelvis is raised above the level of the shoulders (Steissruckenlage of German authorities). This is the favourite position for most operations performed through the vagina, especially those which involve opening the peritoneal cavity. In this position, the anterior vaginal wall does not fall away naturally. In order to get a good view of the cervix, it is necessary to draw it down with a vulsellum, and the handle of the vulsellum kept forward then holds back the anterior vaginal wall. Hence the varieties of Sims' speculum with a broad short blade, such as the short blade in Fig. 37, p. 51, or the speculum shown in Fig. 38, p. 50, are the best adapted for this position. In the speculum devised by Simon, of Heidelberg, as many as eight blades of different breadths and curves can be fitted into two handles. To save an assistant constantly employed in holding the speculum, some forms of specula are made with a weight attached to the handle, which keeps the speculum in position, and the perineum retracted. In the speculum shown in Fig. 39, the handle of the speculum is fitted with a tube, as well as a weight, to carry away the liquid used in irrigation during a vaginal operation. This can be attached to an india-rubber tube. The weight is not so good

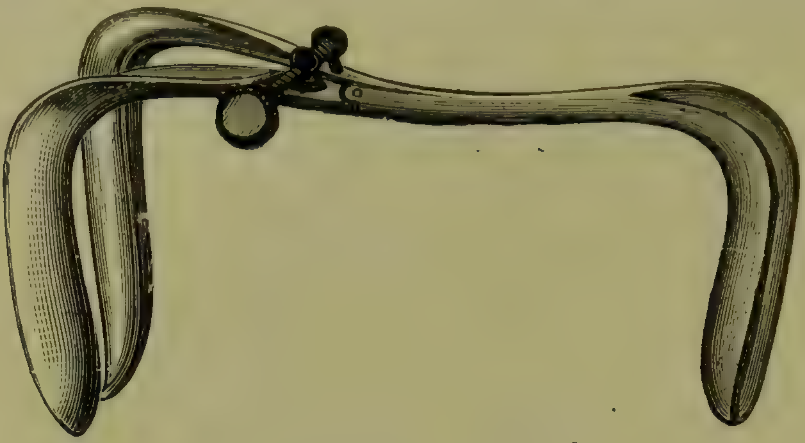

Fig. 36.—Modified Sims' Speculum.

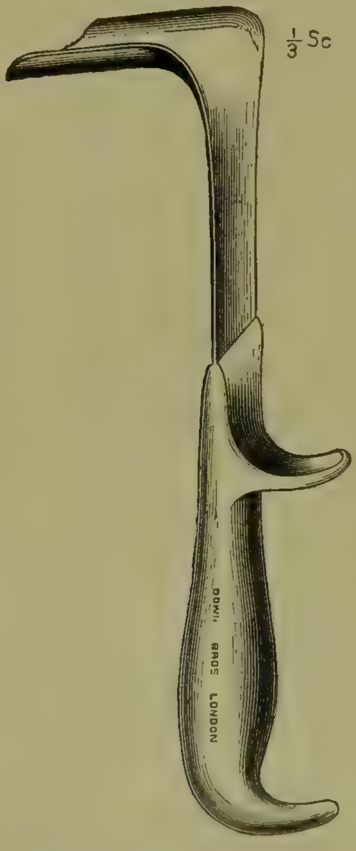

Fig. 38.—Pozzi's Retractor.

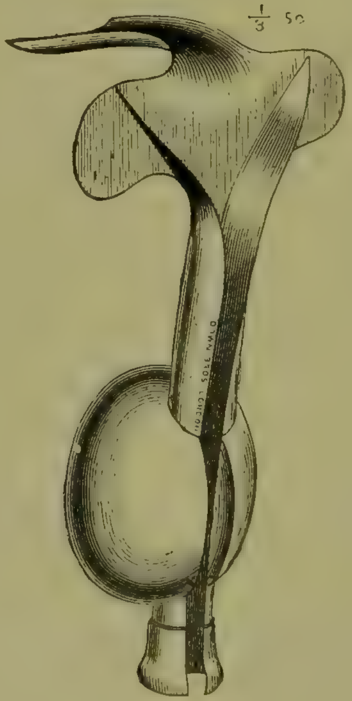

Fig. 39.—Auvard's Operating Douche Speculum.

as an intelligent assistant, who can vary the retraction according to circumstances, and the pressure caused by it has been known to cause sloughing of the tissue pressed upon.

Neugebauer's Speculum.—A fourth speculum often of great service is Neugebauer's speculum (Fig. 40). This consists of two blades, each resembling a Sims' speculum, and introduced in a similar way, but so adjusted that one blade slides within the other in such manner that the two blades in combination form virtually a bivalve speculum. It is inferior to Cusco's speculum in self-retaining power and in efficacy for bringing the cervix into the line of the vagina. Its special advantage is that it can be guided exactly into position by the finger; and thus it is generally superior to all others if a speculum has to be used in a case of cancer of the cervix, for the sake of inspection merely, other specula being liable to set up considerable hæmorrhage. Each blade should be about four inches long, and the handles may be

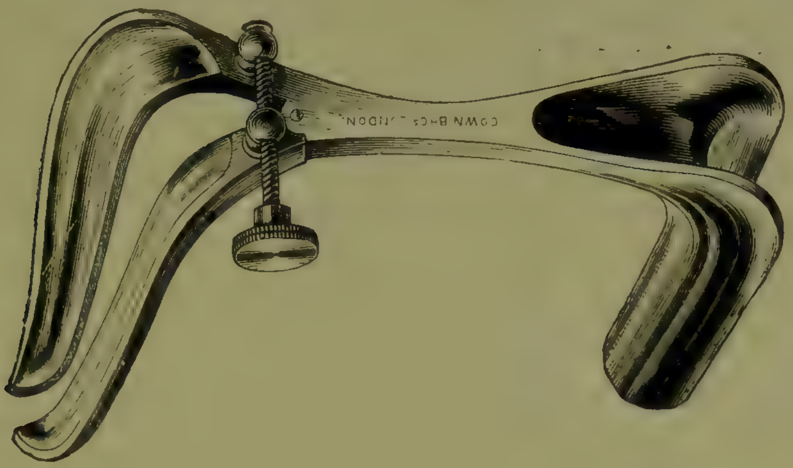

Fig. 37.—**Author's Pattern of Sims' Speculum.**

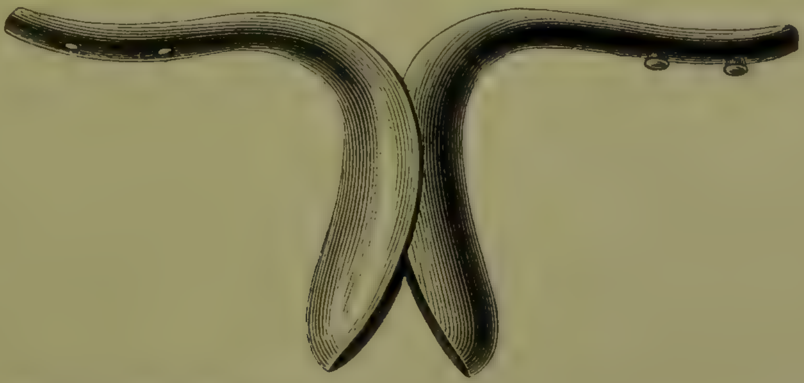

Fig. 40.—Neugebauer's Speculum, the blades of which may be united to form a Sims' Speculum.

so made as to clasp together in a reversed position to form a Sims' speculum (Fig. 40, p. 51). Barnes' crescent speculum is a modification of this instrument. For each handle another blade of different size is substituted. Thus the two pieces make a series—three different sizes of speculum—Nos. 1 and 3 being in one piece, and Nos. 2 and 4 in the other. For the use of Neugebauer's speculum the patient may be either in the semi-prone position or in the lithotomy position, with the nates overhanging the end of the table. The larger blade should be introduced first, and guided by the finger into its position behind the cervix; the smaller blade will then slide into position within it.

Dilatation of the Cervix.—The diagnosis of morbid conditions of the mucous membrane of the uterus, and of the presence of tumours or the products of conception within its cavity, is in many cases rendered impossible by the closure of the os. Dilatation of the cervix is then the only method of detecting the disease, and is of still greater importance in allowing access for therapeutical means.

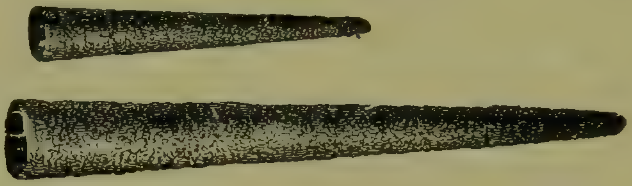

Fig. 41.—Sponge Tents.

Dilatation by Tents.—Dilatation may be effected either rapidly under anæsthesia by mechanical dilators, or gradually by means of tents. Mechanical dilators, especially Hegar's dilators, have to a great extent superseded the use of tents. But when it is desired to dilate the cervix sufficiently to introduce the finger to explore or operate, it is better to commence with some gradual means, such as the use of tents, except in the case of a uterus softened by recent pregnancy or abortion, or already partially dilated. Otherwise the lining of the cervix is inevitably split, and sometimes a great part of its thickness. On removal of the tent the dilatation is completed by the rapid method under an anæsthetic.

There are three substances used for the manufacture of tents—compressed sponge, the laminaria digitata, or sea-tangle, and the root of the tupelo tree (*nyssa aquatica*), introduced from America. two, at least, of which have special advantages under different circumstances. Sponge tents have practically become almost obsolete on account of their tendency to promote decomposition and septic absorption. If used at all they should be impregnated with iodoform by being dipped in a solution of iodoform in ether. They should be made of a uniformly conical shape, not bulging at the centre, and the string for their withdrawal should be attached to the upper extremity, and pass through the length of the tent, since it is otherwise liable to break away, and leave the greater part of the tent within the uterus. Laminaria tents (Fig. 42) should be perforated from one end to the other, to allow them to be fixed upon a stylet for introduction, and to render their expansion more rapid and complete.

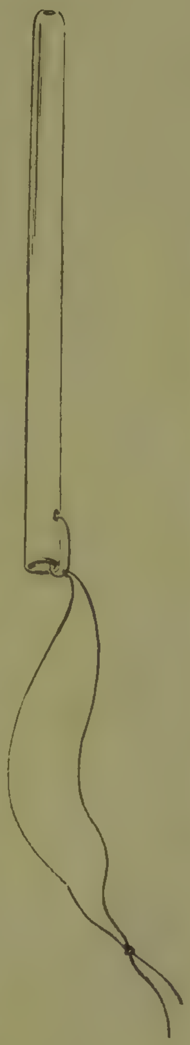
Fig. 42.—A Hollow Laminaria Tent (actual size).

Relative Advantages of Sponge, Laminaria, and Tupelo Tents.—A sponge tent insinuates itself very closely into the interstices of the mucous membrane, and on this account it is less liable to slip out, and forms a more efficient plug in cases of hæmorrhage than the laminaria tent. It also causes less pain during its expansion than the harder laminaria tent. Sponge tents used therefore to be recommended for the arrest of hæmorrhage, and in cases in which it was desired to remove the surface of the mucous membrane. The latter object is much more safely attained by curetting.

Laminaria tents are the best to commence dilatation with. They can conveniently be made of small size, are smooth when prepared, and easy to introduce. They cannot easily be obtained of large size, but a wide dilatation can be obtained by packing several laminaria tents side by side in the cervix.

Tupelo tents can be obtained of larger size than laminaria tents, and are more rapid in their expansion. They can also easily be pared down by a penknife to any required size, and do not promote decomposition like a sponge tent. They have not, however, the same expansive force as laminaria tents, nor do they expand to so great a multiple of their original size. A tupelo tent is very convenient for use when one laminaria tent has already been employed, and it is desired to obtain a more complete dilatation of the cervix within a few hours. A solid tupelo tent also forms an efficient plug against hæmorrhage, if it fits closely in the cervix when introduced.

Sterilization of Tents.—Laminaria and tupelo tents are most conveniently sterilized by keeping them in stoppered bottles in a solution of iodide of mercury in absolute alcohol, 1 in 500. The alcohol alone is sufficient to sterilize them, but the mercury renders them to a certain extent antiseptic against the vaginal saprophytes.

Mode of Introducing Tents.—In most cases a perforated laminaria tent is introduced most easily by the tent-introducer, contrived by Dr. Barnes (Fig. 43). It consists of a metal handle carrying a curved stem, at the extremity of which stylets of various sizes can be screwed in, and over which slides a metal tube. The tent being fixed firmly upon the stylet, the whole instrument is introduced exactly like the uterine sound, and the tube is then held steadily against the os, the disc at its lower extremity giving a point of resistance to the finger, while the stylet is withdrawn. The tent may be smeared with lano-creolin, which aids in preventing decomposition. A solid tupelo tent may also be introduced by the same introducer, the wood being soft enough to allow the sharp terminal to be pushed into it. After the tent is introduced a strip of sterile iodoform gauze (10 per cent.) should be pushed up under the end of it, to prevent its slipping out before it has time to swell, and should lightly fill also the rest of the vagina.

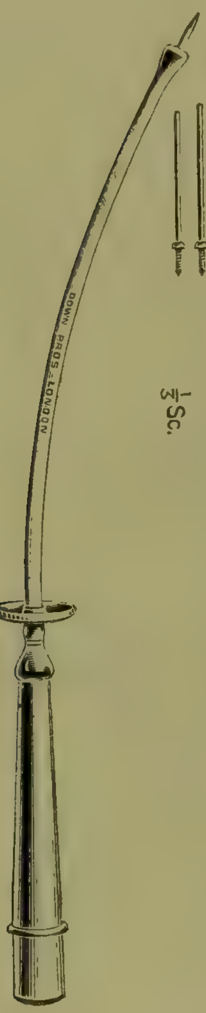

Fig. 43.—Barnes' Tent Introducer.

Another method of introducing a tent is to employ Sims' speculum and the semi-prone position. For a sponge or tupelo tent, this plan is generally preferable, and it should be adopted in all cases of difficulty, even for the introduction of a laminaria tent. By the tenaculum hook or tenaculum forceps, the cervix is drawn nearly into the line of the vagina (Fig. 44, p. 55), and the direction of the uterine cavity is ascertained by the sound or probe. The tent is then guided into place either with a pair of forceps, or, more conveniently, by the tent-introducer, in the case of a sponge, or perforated laminaria tent. For a solid laminaria or tupelo tent, the forceps may be used. If laminaria tents are made about five inches long, instead of the usual length of about two inches, and are passed up nearly to the fundus, they are free from the risk of slipping out, but have the disadvantage that they hold the uterus forcibly in a position of retroversion, and hence cause more irritation. In some cases of fibroid tumour, in which the cervical canal is elongated, it is absolutely necessary to use a tent of extra length, in order to ensure its reaching within the internal os.

If pain is produced during the expansion of a laminaria tent, a morphia suppository should be administered. If the internal os is very rigid, pain may be great enough to call for more decided opiate treatment. In such case the tent may be so tightly constricted at one point as to prevent any great expansion, while it swells above and below. The extraction may then be somewhat difficult, and firm counter-pressure by the finger against the cervix may be required to effect it.

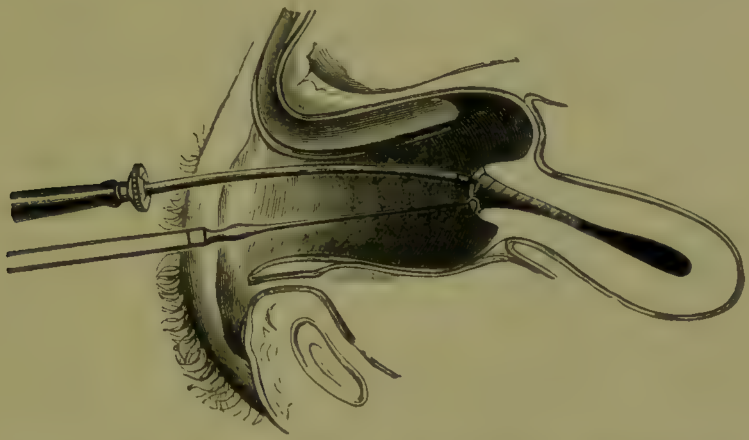

Fig. 44.—Mode of Introducing a Tent through Sims' Speculum.

Before the introduction of a tent, it is useful to fasten a sterilized tape to the loop of thread which is passed through it. This tape serves to withdraw the tent. It is also convenient, when a second tent is being introduced by the side of the first, to hold the first steady by means of the tape, and so prevent its being pushed up too far. Care must be taken to leave the ends of the tents projecting through the external os, otherwise the tents are apt to expand in the canal, leaving the os undilated, so that it may be impossible to remove them except by incising or dilating the os. For withdrawal the loop of thread is generally sufficient. If this should break away, the tent being firmly gripped at the internal os, the end of the tent must be firmly seized with suitable forceps and drawn down.

Dangers from the Use of Tents, and Precautions required.—No small number of cases is on record in which the use of a tent has been followed by metritis, pelvic cellulitis or peritonitis, or even general and fatal septic peritonitis. The chief source of danger is the absorption of septic material by the lymphatics, a consequent rapid spread of inflammation along their course, and in some cases an almost immediate conveyance of septic contagion to the peritoneum. On this account rapid dilatation under anæsthesia by instrumental means is preferable, when only a moderate dilatation is required as for curetting or obtaining a specimen of the endometrium by a scoop, or when the cervix is already softened as after an abortion, especially if there is reason to suspect that there may be septic material within the uterus.

The danger may, to a very great extent, be avoided by suitable precautions. Serious effects have more frequently occurred when a series of tents has been used to effect progressive dilatation. The most important precaution, therefore, next to the sterilization of the tents and all other materials used, is not to employ tents more than twice in immediate succession, but if sufficient dilatation has not then been effected, to wait awhile before resuming the process, or complete it by rapid dilatation. In dilatation for the purpose of diagnosis, or gaining access to a tumour, laminaria tents are the best to use. As many of these as can be introduced without force should be placed side by side. This may be done either at the first sitting, if the cervix is not small, or after preliminary dilatation by a single tent. An antiseptic vaginal injection with perchloride of mercury, 1 in 2,000, should be used before the insertion of a tent and after its removal, the vulva should be disinfected with special care, and a sponge tent should not be left in place more than eight, or a laminaria tent more than eighteen, hours. Generally six hours are sufficient to gain the full amount of expansion from a sponge or tupelo tent, and twelve from a laminaria tent. If any rigor or rise of temperature occur, dilatation should at once be suspended.

It is of the utmost importance also that the patient should be in bed when a tent is introduced, and should remain so until at least twenty-four hours after its removal. Tents should not be used, unless for extremely urgent cause, when any recent acute inflammation is present; and in cases of pelvic peritonitis, even of an old or chronic character, they should be avoided as a rule, since such an inflammation is apt to be rekindled on slight provocation.

A mechanical dilator which may be used as a preliminary instead of tents, when it is required to dilate up the cervical canal for exploration by the finger, is Schatz's metroikter* (Fig. 45). It consists of two arms united by a strong, nearly circular, spring which tends to separate them. When closed they form a kind of peg, 5·5 cm. in length, and 5 mm. thick. When separated the tips of the two arms are about 5 cm. apart. The strength which is required to bring them together is the strength of the metroikter, and varies in different sizes from 3 to 8 kilogrammes. The instrument is introduced by means of special forceps, which lock the arms together by means of studs placed upon the spring. The spring being released, the dilator works by its elasticity. A tampon is placed in the vagina to keep the dilator from slipping out before the arms have begun to diverge, after which it keeps its place automatically.

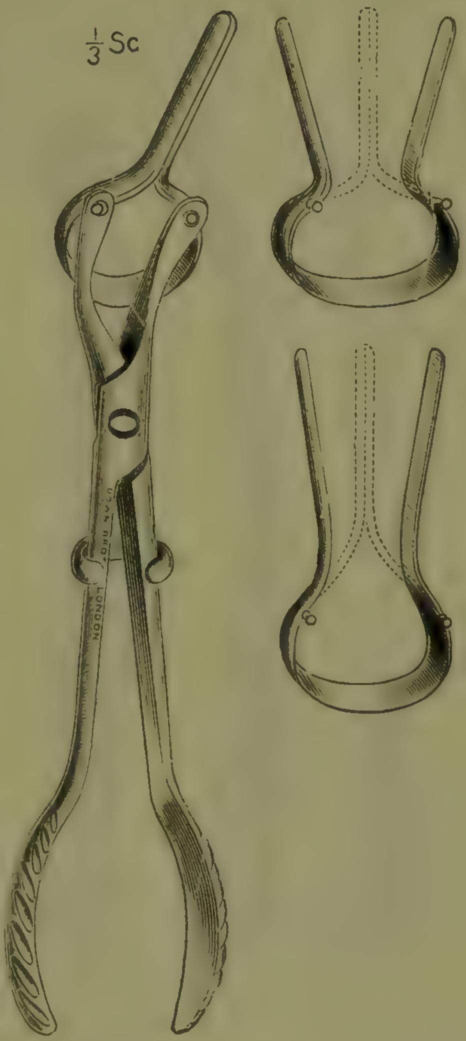

Fig. 45.—Schatz's Metroikter.

It is obvious that the force exercised by this dilator is very considerable at first, but diminishes as the arms diverge. It avoids the inconvenience sometimes found in the use of a laminaria tent that a rigid internal os remains comparatively undilated, while the tent swells above and below it. On the other hand, it would seem that the pressure of two thin bars must be more likely to injure or tear the tissues than the pressure diffused over the whole circumference of a tent. With the canal at the size of No. 10 Hegar's dilator, the pressure would be about twice as great for the same amount of stretching effect on the encircling ring; with the canal at the size of No. 15 Hegar's dilator, about three times as great. A similar principle holds true of stretching by any two-bladed dilator, as compared with dilatation by a cone or cylinder such as Hegar's dilators; but injury by pressure, as distinct from tension, is less likely from the comparatively short dilatation under an anæsthetic than from a spring working automatically for many hours.

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* See David and Schneider-Sievers, "Journ. of Obstet. and Gynæc.," Sept., 1902.

Instruments for Rapid Dilatation: *Hegar's Dilators.*—Hegar's dilators are intended for rapid dilatation of the uterine canal, with the aid of an anæsthetic, as an alternative to gradual dilatation by tents. They consist of a series of twenty-five slightly curved stems about five inches long, the successive sizes numbered according to their diameter in millimetres, that is, ranging in diameter from one-twenty-fifth of an inch up to a little more than one inch (Fig. 46). The stems are provided with a flattened handle; or, as in the most modern pattern, the handle is of vulcanite, and in one piece with the stem. The successive sizes are passed like the ordinary sound, or with the aid of Sims' speculum, the anterior lip of the cervix being firmly held by two vulsella side by side, of the pattern shown in Fig. 26, p. 40. The drawing down of the uterus tends to straighten its canal. The latter mode is generally better. Another plan, which may sometimes be used with advantage in the case of the larger sizes, is the following. The patient is placed on her back, and the fundus grasped by the external hand. The point of the dilator is guided into the cervix, and pressed upward by the intra-vaginal fingers, while the external hand presses down the fundus over the dilator, as a glove is slipped over the finger.

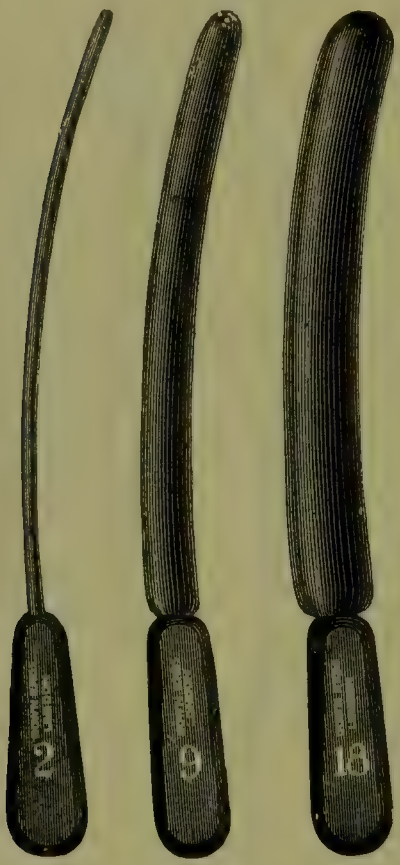

Fig. 46.

The smallest sizes of Hegar's dilators are more difficult to pass than the larger, when the cervix is very narrow. Being weak, they cannot be so well directed, and the narrow point is more liable to make a false passage, or even pierce the uterine wall.

I prefer, therefore, to commence the dilatation with the graduated sizes of conical metal dilating sounds described in Chapter V. as used for stenosis of the canal. These are passed without speculum like the ordinary sound, care being taken not to pass them into the uterus farther than the notch marking the normal length of the canal. It will first have been ascertained by the sound that the length of the uterus is not less than normal. When these have been passed, it will be practicable to begin with about No. 8 Hegar's dilator.

When a dilator passes quite easily, the next may be passed in immediate succession. If much resistance is found, it should be left in place from one to two minutes, to allow the tissues which are tightly stretched around it time to yield.

When any dilator has passed the resistance of the internal os, it will be found to go on without any further considerable resistance to the fundus, and is there felt to impinge against the top of the uterus. The operator is thus assured that the dilator is within the uterus and not in any false passage.

In cases of abnormal rigidity of the cervix, a good deal of resistance may be met with in passing Hegar's dilators, especially from the size of No. 10 upwards, the gradations of size being hardly near enough together for such cases. Under these circumstances it is a good plan to resort to the form of dilator shown in Fig. 47. These are made in metal, and form a much more tapering cone than Hegar's dilators. They thus form a wedge which has a very much greater dilating power in proportion to the longitudinal pressure exerted than the very blunt cone of the extremity of Hegar's dilator, which forms the acting wedge.

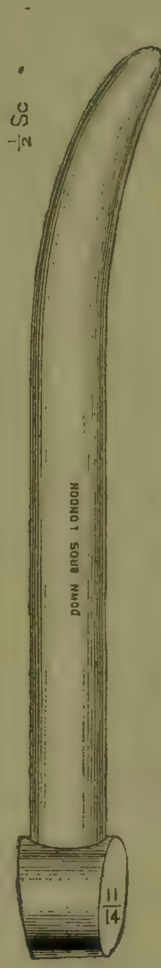

Fig. 47.—Hawkins-Ambler's Uterine Dilator.

More care is requisite in their use, for two reasons. First, on account of their much greater power to split the cervix with an equal or even much less longitudinal pressure. Secondly, the dilator is resisted throughout the whole of its course, whereas a Hegar's dilator slips suddenly past the point of constriction, and then goes on easily. Thus the operator might be pushing the dilator through the fundus without knowing that he had reached it. It is necessary, therefore, to be very careful not to try to push in the dilator quite so far as the length of the uterine canal. These dilators are generally made to taper over four sizes of Hegar's dilators, as, for instance, from No. 8 to No. 12.

In a slightly different pattern (Fig. 48), the dilator is perforated, with the idea of avoiding the risk of secretion or blood being forced from the uterus along the Fallopian tubes into the peritoneal cavity. This prevents the extremity being so certain of riding easily over any inequality; and experience does not appear to show the risk to be of consequence. When the uterus is empty, its walls lie almost in apposition, and no appreciable amount of fluid remains within it.

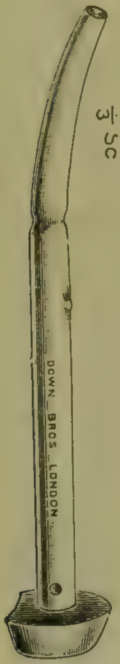

Fig. 48.—Hollow Uterine Dilator.

Expanding Metal Dilators.—Metal dilators, with expanding branches, which are used for dilatation in stenosis, may sometimes conveniently replace conical dilators in dilatation for exploration. One of the cases in which they have most advantage is that of a narrow, conical cervix, when the edge of the os is so thin that vulsella cannot obtain sufficient hold for counter-traction to the pressure in the use of Hegar's dilators without the risk of tearing out.

Expanding dilators have the advantage that all the force used is expended in dilatation, and none is wasted in overcoming friction. On the other hand, it is more difficult to judge the force employed, if the expansion is effected by a screw. Owing to the elasticity of the blades, the actual dilatation produced is often less than that indicated by the position of the handles to an indeterminate extent, while with Hegar's dilators the exact degree of dilatation is known. Again, the blades pressing at intervals and distorting the ring of the cervix more or less from a circular form appear more likely to cause laceration than the absolutely uniform pressure of the rounded end of a cylinder or cone.

I consider, therefore, that the Hegar's dilators are preferable as a rule. But an expanding dilator may be used if any given size of Hegar's cannot be passed without too much force, and risk of the vulsella tearing out from the cervix. The best forms are Sims' dilator (Fig. 49) for a three-bladed dilator, and

Goodell's (Fig. 50) for a two-bladed. The former has the disadvantage that the points diverge more widely than the blades, and dilate the internal os more than the external when the blades are widely open, while in the earlier stage of dilatation the opposite is the case, and the instrument is apt to be forced partially out of the cervix. In the latter, the dilating blades are kept parallel. In the use of it, the handles should be approximated by the pressure of the fingers applied intermittently, and the screw only used to maintain, in the intervals of compression of the handles, the amount of dilatation already

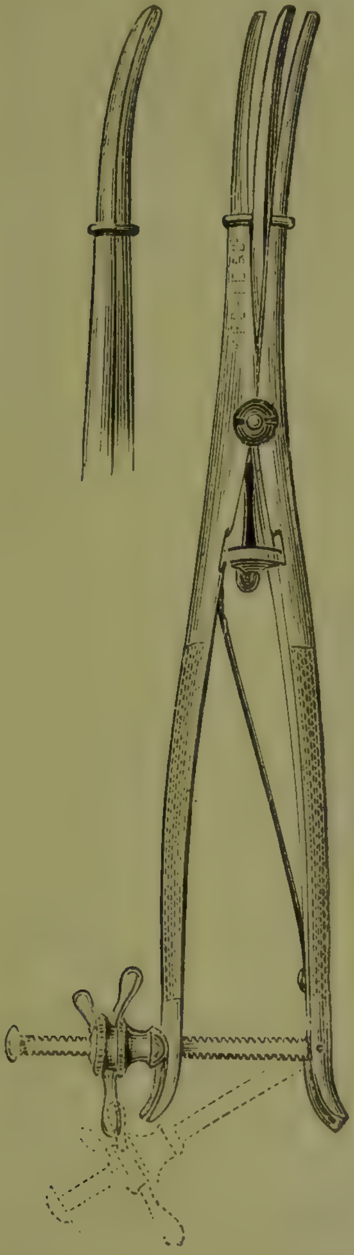
Fig. 49.—Sims' Uterine Dilator.

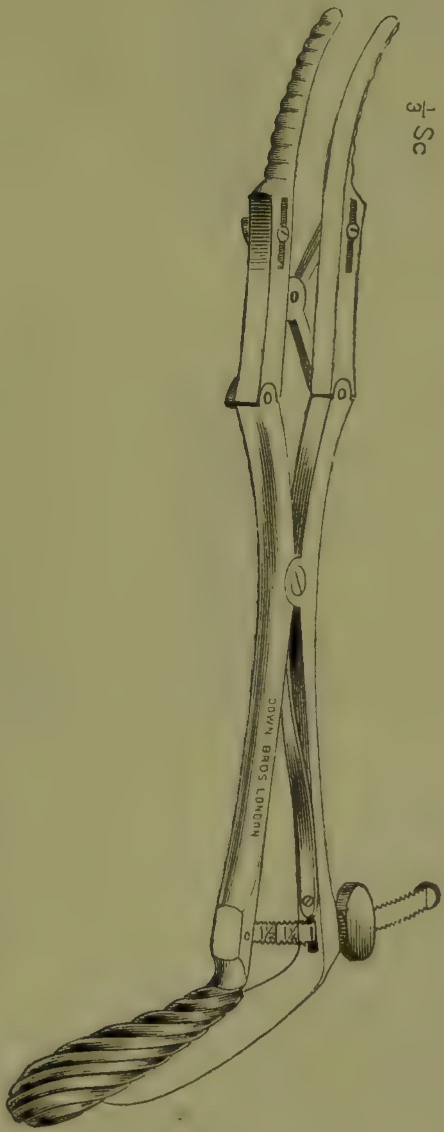

Fig. 50—Goodell's Uterine Dilator.

gained. In this way it is possible to judge of the degree of dilating force used.

The advantage of being able to do this, and that of the parallelism of the blades being maintained, appears to outweigh

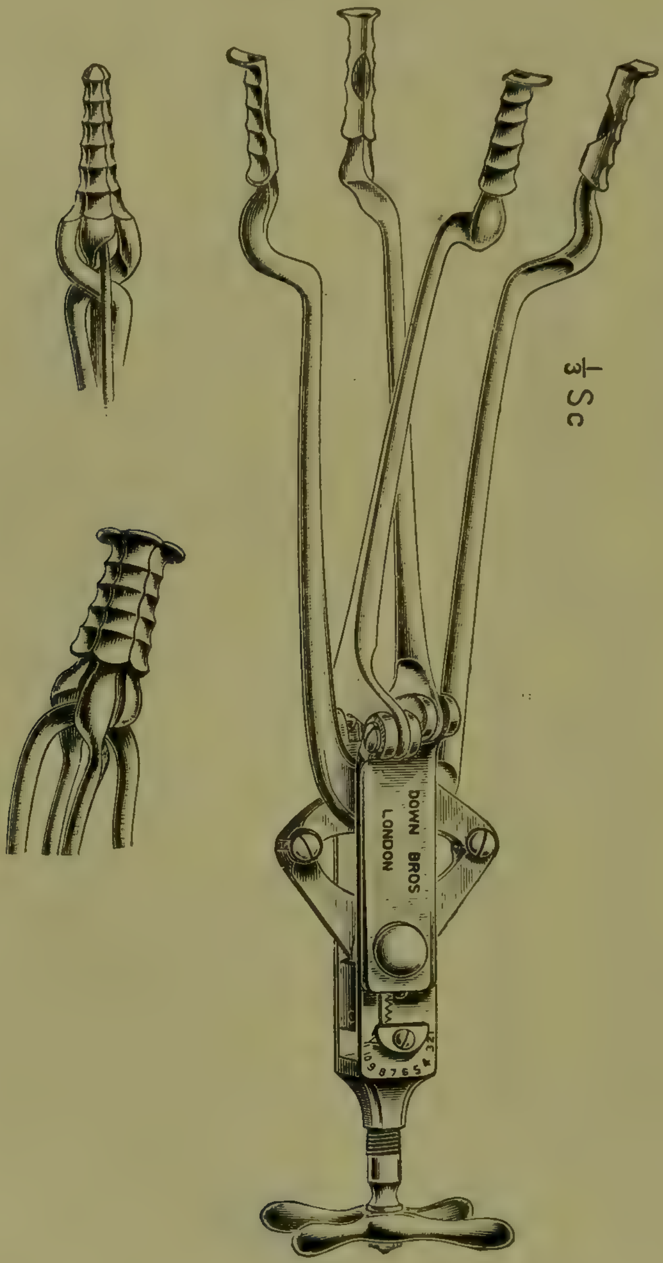

Fig. 51.—Bossi's Uterine Dilator.

the slight advantage of having three blades instead of two, and to give Goodell's dilator the preference over Sims'.

Bossi's dilator (Fig. 51), intended primarily for dilatation of the parturient uterus, may also be used for the unimpregnated uterus, if the covers on the branches are removed, as seen in the upper left-hand figure. As compared with Goodell's dilator, it has this advantage, that, with a four-armed dilator, the pressure on the cervical wall required to produce any given amount of tension in the cervical ring encircling the branches is only about 70 per cent. of that required with a two-armed dilator. On the other hand, as the expansion is made by a screw, it is not so easy to estimate the resistance met with, which can only be judged of by the difficulty in turning the screw. It must be remembered that the instrument has irresistible power, and that, if the cervix does not dilate, it must tear.

Bossi's dilator is specially useful if the uterus is much enlarged, as by a fibroid tumour, and a very wide dilatation is required, as for the enucleation of a fibroid. For the arms can expand to a degree far exceeding that attainable either by tents or Hegar's dilators.

The resistance of the cervix to dilatation varies very much in different cases. When the cervix has even its normal rigidity, sufficient dilatation to allow the passage of the finger cannot be obtained at one sitting without the use of considerable force and the production of laceration. As a rule, gradual dilatation causes less injury to the cervix, and is preferable in these cases, provided that antiseptic precautions can be maintained. If there is any source of septic material present, such as a portion of retained ovum, rapid dilatation should be chosen in preference; under these circumstances the cervix is rarely very rigid.

Lawson Tait's Dilators.—Lawson Tait's dilators consist of graduated vulcanite cones which can be screwed into a straight stem. Pressure is applied by elastic bands fixed to the lower end of the stem, and attached to a suitable belt. A projecting flange below the cone prevents the instrument from passing too far into the uterus. The straight stem is obviously faulty. The stem ought to be S-shaped, having a vaginal and perineal curve, like Aveling's repositor for inversion of the uterus. Another drawback to the instrument is that it requires watching and readjustment during the process of dilatation. It is therefore better suited for hospital than for private practice.

Dilatation by Iodoform Cotton.—A plan for effecting a more complete and prolonged dilatation, which may be maintained for many days, and even several weeks, was introduced by Vulliet.* Cotton is impregnated with iodoform by means of a 10 per cent.

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* "Archiv. de Tocol.," Oct. 30, 1886.

solution in ether. Pieces of this iodoform cotton, about the size of an almond or less, are taken, and a thread is attached to each, to facilitate its withdrawal. The cervix is packed with these, and the packing is renewed about every forty-eight hours. Strips of iodoform gauze may be used in the same manner. In this way, the contractile power of the circular muscular fibres is gradually wearied out. This plan may be tried in cases in which dilatation by tents fails to afford sufficient access to an intra-uterine tumour which it is intended to remove.

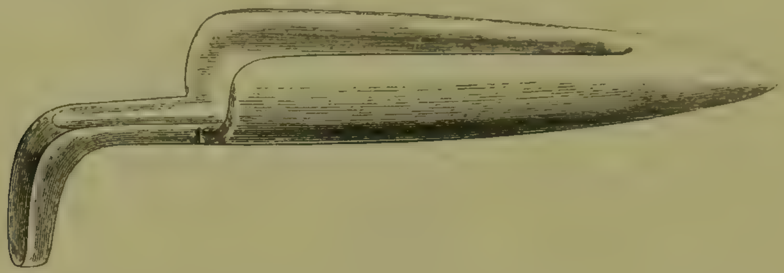

Fig. 52.—Bryant's Urethral Speculum Dilator (actual size).

Hydrostatic Dilators.—It is to be noted that Barnes' hydrostatic dilating bags are not suitable for dilating the unimpregnated uterus. Unless the uterus is greatly enlarged by a fibroid tumour, the bag is too large to introduce; and, when it is so enlarged, a greater dilating power is required.

Inspection of Urethra and Bladder.—The entrance of the urethra, including the orifices of Skene's ducts, may be inspected internally by drawing the edges of the orifice apart laterally with the two index fingers. The walls of the canal may be inspected by the aid of Bryant's urethral speculum dilator (Fig. 52), the slit in which may be turned in any direction. Another convenient speculum, which shows a large portion of the walls of the urethra at the same time, and requires less dilatation, is the wire speculum shown in Fig. 53. Yet another method is to pass Kelly's vesical speculum into the bladder and gradually withdraw it. The walls of the urethra are then well seen as they fall together in funnel shape as the end of the speculum is withdrawn. For this purpose the urethra should be dilated up to at least 10 mm. diameter.

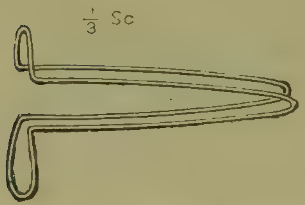

Fig. 53.—Lucy's Urethral Speculum.

The interior of the bladder may be inspected by the ordinary cystoscope with oblique mirror. A much better view is obtained, and at the same time access of instruments, and catheterization of the ureters is allowed by Howard Kelly's method of dilatation and the use of his cystoscopes. These cystoscopes form a series of cylindrical vesical specula of polished metal from 5 up to 20 mm. in diameter (Fig. 54), thus corresponding in size and number to Hegar's dilators. Each speculum has a funnel-shaped expansion at the outer end, 15 mm. long, inclined at an angle of 60° to the cylinder, and a blunt-ended obturator to facilitate the introduction of the speculum. The sizes below No. 12 are used for examination, and those above to secure a wide lumen in operations upon the bladder. Generally No. 10 is sufficient for inspection, and those who are experts in the method may use even smaller sizes; but the urethra may generally be dilated up to No. 16 without laceration of consequence, or any, even temporary, incontinence of urine following.

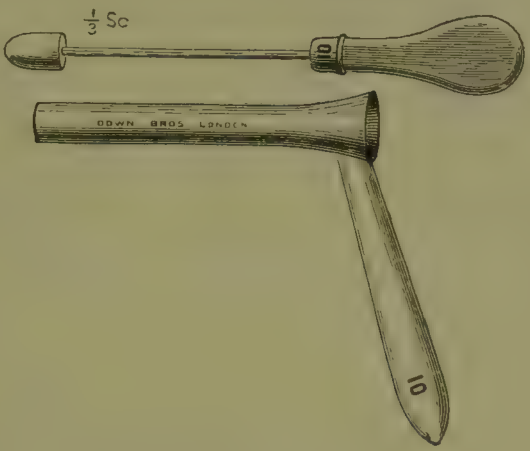

Fig. 54.—Howard Kelly's Vesical Speculum, with Obturator.

Simon's urethral speculum (Fig. 55), designed for use in the same way, is made of vulcanite, is somewhat shorter, and without the conical expansion. It is best held by seizing the rim with pressure forceps. In some cases the shorter length is an advantage, but the vulcanite does not reflect light so well as the metal, so that a somewhat larger size is generally required.

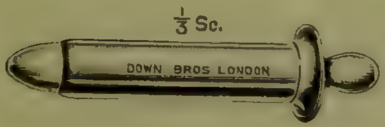

Fig. 55.—Simon's Vesical Speculum.

For dilatation, Kelly uses a urethral callibrator and dilator, which is a simple blunt-ended cone, with the diameter in millimetres marked at the various levels. This is used first to determine the actual size of the urethral orifice, and then to dilate it to the size required, since it is found that only at the orifice is serious resistance met with, and the rest of the urethra is so elastic that the obturator is capable of dilating it. If, however, dilatation beyond No. 12 is required, it is better to use an expanding dilator, such as Goodell's uterine dilator (Fig. 50, p. 61), or to use in succession the metal urethral dilators, corresponding to Hegar's dilators, shown in Fig. 56.

The object of the method is to adopt a position which causes the bladder to become expanded with air. The most universally applicable is the knee-elbow position, the knees being separated 10 or 12 inches. This may be used by an expert without an anæsthetic, if no great dilatation of the urethra is required, and the patient is tolerant. A 10 per cent. solution of cocain may be applied within the urethral orifice for five minutes by means of a Playfair's probe or rod, wrapped in cotton wool. If an anæsthetic is given, the best way to hold the patient in the knee-elbow position is for two assistants to stand, one at each side, close up to the body to prevent it from falling sideways, each grasping the body with one arm thrown over the back, and holding the leg in the crotch of the knee with the other hand to keep it from slipping up or down. The buttocks may also be supported by thigh-bands suspended from the top of vertical rods attached to the table.

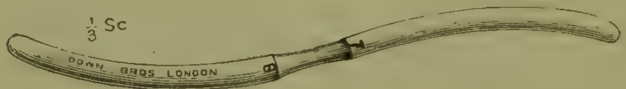

Fig. 56.—Kelly's Urethral Dilator.

The other position is the exaggerated lithotomy position, as shown in Fig. 57. This is more convenient for the administration of an anæsthetic. It answers in most cases, but the atmospheric expansion of the bladder is not so great, and, in a fat patient does not occur at all. If, however, the patient be on the operating table shown in Fig. 68, page 80, the inclination of the table may be increased until the pelvic viscera gravitate toward the diaphragm sufficiently to cause suction of air into the bladder.

The light may be reflected from a laryngoscope mirror attached to the forehead ; but the arrangement of a small electric light on a spectacle frame, and attached to a portable accumulator, as shown in Fig. 57, is more convenient. The speculum is introduced by the obturator. As soon as the obturator is removed, air enters, the bladder expands, and its walls become comparatively bloodless. The residual urine must first be withdrawn from the bladder, and this must be repeated from time to time if the examination is prolonged, especially if the patient is in the dorsal position, for then a little urine in the bladder easily obscures the field of view. A small syringe with a long nozzle of flexible metal may be used for the purpose. Kelly uses an evacuator, consisting of a small hollow perforated metal ball, attached by fine rubber tubing, about 14 in. long, to a rubber exhausting ball which is worked by an assistant.

The speculum can be turned in all directions in order to view different parts of the bladder. With a slight withdrawal of the speculum, and a marked elevation of the handle, the vesical triangle comes into view, always a little more injected than the rest of the bladder, in consequence of the fact that the mucosa and underlying tissues are intimately connected, and thus this part is prevented from expanding and becoming anæmic like the rest of the bladder.

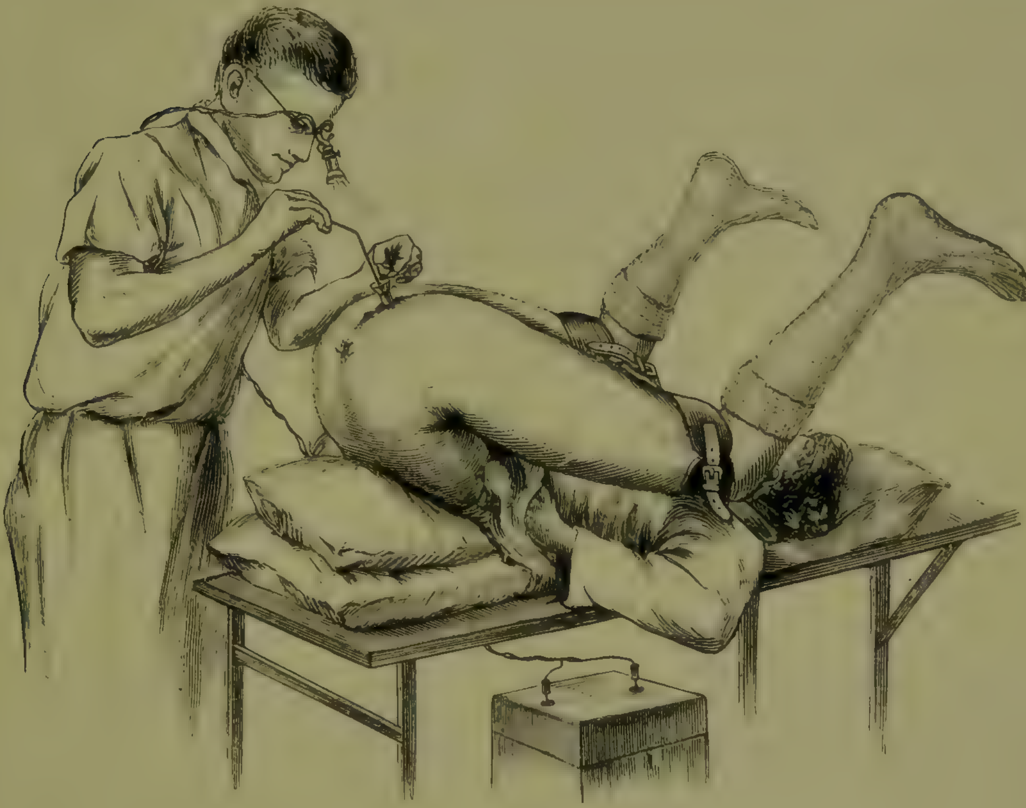

Fig. 57.—Exploration of Ureter, with Ureteral Searcher. (Modified from Howard Kelly.)

If the speculum is turned from 25° to 30° to the right or the left, a little pinkish prominence is seen, the mons ureteris, which marks the position of the ureteral orifice. The orifice itself generally looks like a fine transverse line, about 2 mm. long, on the side of the mons. Sometimes it appears as a little pit or mere point. If the ureteral orifice is watched for a minute or two, a little urine will be seen to spout out from the surface in a little jet, or escape in drops; and this is again repeated after a minute or so. The intermittent escape is due to the fact that the urine is expelled by a peristaltic wave passing down the muscular urethra.

By holding the end of the speculum close up to the ureter, enough urine can often be caught up with pledgets of cotton to answer the purposes of a physical, chemical, and microscopic examination.

When the patient is in the knee-elbow position, the outer end of the speculum has to be depressed, and the head lowered, often to an inconvenient degree, before a view can be obtained of the ureteral orifice. To diminish this inconvenience, if the vulva does not open spontaneously, a Sims' speculum is first passed to admit air to the vagina. If necessary, a plug may be placed in the vagina, or a spatula used to depress the anterior vaginal wall.

Catheterization of the Ureters.—The position of the ureteral orifice is first verified by the metal ureteral searcher shown in Fig. 58. If there is a difficulty in seeing the ureteral orifice, the speculum is withdrawn till the internal urethral orifice begins to close over the end, when it is pushed about one centimeter farther in, and turned from 25° to 30° either to the right or left, while the outer end of the speculum is elevated, the patient being in the dorsal position. The orifice itself, or the area immediately adjacent to it, now lies within the field of vision, about 1·5 cm. distant from the end of the speculum. If the orifice is not seen after careful search, it may be found by systematically and gently running the point of the searcher over the whole surface where it should be, feeling for it.

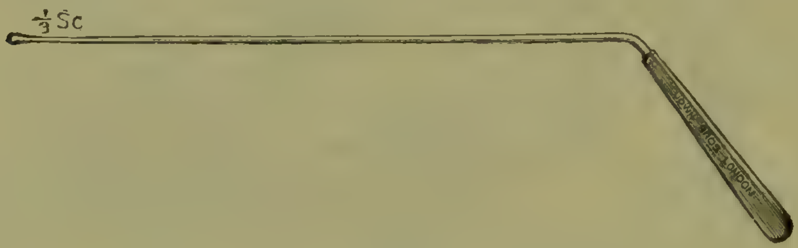

Fig. 58.—Kelly's Ureteral Searcher.

Kelly uses for the ureter a long sterilized flexible silk catheter, introduced by the aid of a stylet; sterilized boroglyceride is used as a lubricant. When the point of the catheter is introduced into the ureteral orifice, the catheter is run off from its stylet, and on up the ureter from 4 to 6 inches. A renal catheter, 20 inches long, is also made, which may be passed up to the kidney, and by which the pelvis of the kidney may be washed out. Very careful antiseptic precautions are necessary to avoid infecting the ureter. If there is septic inflammation of the bladder, it is rarely advisable to catheterize the ureter.

When both ureters are to be catheterized, the speculum is withdrawn and re-inserted beside the first catheter, and the other orifice found and catheterized in like manner. The separated urines may then be collected in test tubes, the orifices of which are plugged with cotton wool around the catheters.

CHAPTER III.

MANAGEMENT OF GYNÆCOLOGICAL OPERATIONS.

Antiseptic Precautions.—Special antiseptic precautions are called for in gynæcological operations, since they either involve opening of the peritoneal cavity, or are concerned with the vulva, vagina, or uterus, all of which are highly vascular and abundantly supplied with lymphatics, and are therefore prone to septic absorption.

The general principle is that asepsis is preferable to antisepsis so far as it is available, so that wounded tissues may be preserved from the irritating effect of the direct application of antiseptics. Antiseptics are called for in situations where complete sterilization cannot be obtained, or cannot be maintained.

Of available antiseptics one of the most useful is lysol, which in most cases may replace with advantage carbolic acid. Its strongly alkaline character gives it a great cleansing power for skin, and for the same reason it has less tendency to rust iron instruments than carbolic acid. For the skin it may be used of a strength of 1 in 80, and at this strength it roughens the skin less than carbolic acid, although its alkaline character renders it more irritating than perchloride of mercury.

Lysol makes a perfectly clear mixture in distilled water, but with hard water is apt to become milky. When it is used to immerse instruments for operation, the water should be cold, or only slightly lukewarm water, which has been well boiled, and the lysol should be mixed in it only shortly before the time when it is wanted. It will then remain clear enough not to obscure the instruments. For this purpose hot water should never be used, nor should the mixture be diluted after the first mixing.

Perchloride of mercury is justly regarded as one of the most efficient of antiseptics, but cannot be used for metal instruments without damaging them. For the skin it may be used in watery solution at a strength of 1 in 1,000, or even 1 in 500. For vaginal and uterine douches it may be used of strengths from 1 in 4,000 to 1 in 1,000. It is not very irritating to the skin, but is apt to stain the nails black.

Iodide of mercury is reputed to be a still more powerful germicide than perchloride of mercury, but is more irritating to the vagina. It is less injurious to metal instruments, which may be dipped in a solution of it for a short time.

Formalin is perhaps the most powerful antiseptic available, and might be used more extensively than it is, but that it sometimes proves irritating to the skin and sets up eczema. It also forms a hard coagulum of blood on the hands or tissues, and is somewhat caustic to raw surfaces. For the skin and for douches it may be used at a strength of 1 in 500. Stronger solutions are excellent for disinfecting metal or other instruments which it is not desired to boil. It makes a perfectly clear solution to immerse instruments in, and is better than lysol for this purpose in the case of things which it is essential to be able to see clearly, such as needles and sutures.

Of the non-poisonous or less poisonous antiseptics the most valuable are chinosol, 1 in 800 to 1 in 400; sulphurous acid, 1 in 80 to 1 in 40; tincture of iodine, 1 in 80; creolin, 1 in 100. These may be used for washing out cavities or for vaginal douches. For all such douches, especially with a weaker or more diluted antiseptic, it is an additional security to use boiled water.

Antisepsis is concerned with the preparation of the operator, with the assistants and nurses, of the patient, and of the instruments and other materials used in the operation.

Preparation of Operator and Assistants.—For disinfection of hands the following appears to be satisfactory. The surgeon should keep his nails very short, so that they can harbour no foreign material beneath them. Nail brushes should be kept in covered glass vessels in antiseptic solution, such as lysol, 1 in 80. The hands, and especially nails, are scrubbed thoroughly with a nail brush, first in hot water with soap, then in lysol, 1 in 80. They are finally soaked in a solution of iodide of mercury in spirit, 1 in 500. A basin of watery solution of perchloride of mercury, 1 in 1,000, is kept at hand during the operation, and the hands are occasionally dipped in it, especially before handling sutures.

It is very difficult to make the sterilization of the hand theoretically perfect, since the *Micrococcus epidermidis* is apt to make its appearance from the deeper layers of the skin as time proceeds. On this account some operators wear thin india-rubber gloves, or thread gloves soaked in an antiseptic, during an operation. This impairs the sense of touch; and the process above described gives practically satisfactory results. Probably no operation is absolutely germ-free, but success is attained if microbes which may gain access are not virulent, and not too many for the tissues to dispose of. It is an advantage, attended by less drawback, if the assistants, and especially the assistant who handles ligatures and sutures, wear rubber gloves.

The following process, much used in America, is said to produce the most perfect sterilization of hands, as tested by cultures. The hands, after scrubbing in soap and water, are steeped in saturated hot solution of permanganate of potash till they are stained deep brown. They are then soaked in hot saturated solution of oxalic acid till they are completely decolorized. Finally, the acid is removed by dipping them in lime-water.

The *Micrococcus epidermidis* is not generally virulent, but it may cause eventual suppuration in ligatures or sutures, especially in silk. The operator and his assistants should, therefore, avoid touching silk or other sutures with the fingers as far as possible. The assistant should hold the silk by forceps to thread it. The operator, in placing a ligature or interrupted suture, should tie it without touching with the fingers the part to be left, including loop and knot. When a continuous suture is used the assistant should keep the end taut by holding it, not with the fingers, but with the suture forceps shown in Fig. 59.

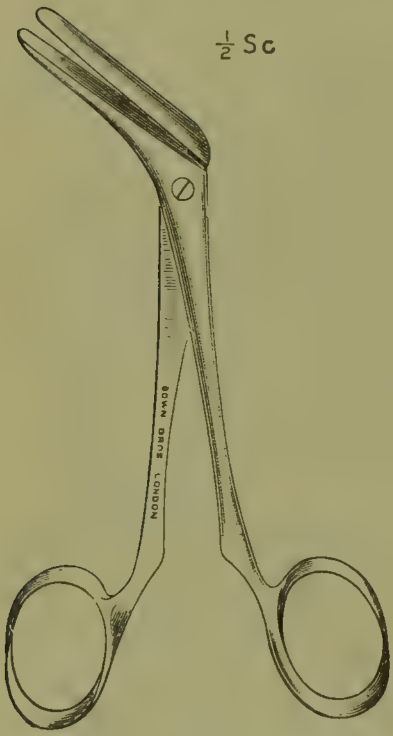

Fig. 59.—Suture-holding Forceps.

For the operation the operator should remove his coat, roll up shirt sleeves above the elbow, and wear an overall reaching below the knees, and having sleeves down to the elbow, either sterilized or soaked in antiseptic solution, such as lysol, 1 in 80. In the latter case it is necessary to wear a mackintosh underneath it, to keep the clothes dry. Thus the operator cannot, during the operation, touch any non-sterilized part of his clothing. Assistants and nurses who take any part should be similarly attired.

If operating in a mackintosh in a hot room it is advisable for the operator also to disinfect his head and forehead, lest any drop of perspiration fall from thence.

Preparation of the Patient.—For a vaginal operation the patient should be prepared by several preliminary douches of perchloride of mercury, 1 in 2,000. At the time of operation the vagina should be swabbed over thoroughly with perchloride of mercury, 1 in 500, or the solution of iodide of mercury in spirit, above mentioned. Some try to sterilize the vagina by prolonged and vigorous scrubbing with a brush. But the normal vagina is said not to contain septic microbes, and it is impossible ever to sterilize the vagina as regards saprophytes on account of the irregular recesses of the cervix uteri, as well as the vaginal rugæ.

If there is reason to suspect the presence of gonococci or septic microbes, an attempt may be made to sterilize by previously applying tampons soaked in an antiseptic, such as perchloride of mercury in glycerine, 1 in 1,000.

It is still more important to cleanse and disinfect the vulva, since micrococci are generally present in the alkaline vulval secretion. The vulva may be scrubbed with lysol, and afterwards washed over with the mercury solution. The hair should be previously shaved, except for slight operations, such as dilatation or curetting of uterus. If the lithotomy position is used, the legs should be covered with leggings, sterilized or soaked in lysol solution. A mackintosh covered with a sterilized or lysol towel should be placed under the buttocks and another over the lower abdomen. If the lateral or Sims' position is adopted, one mackintosh covered with sterilized or lysol towel is placed under the patient, another to cover the hips and legs.

In operations on the vulva and perineum it is almost impossible to maintain successfully an antiseptic dressing. If this cannot be done, the next best thing is to leave wound and sutures without any covering. In some limited operations, such as the excision of a vulvo-vaginal gland, primary union may be secured by a sealed collodion and iodoform dressing over antiseptic gauze.

After vaginal operations I am accustomed, unless the peritoneum has been opened, to order vaginal douches twice a day of perchloride of mercury, 1 in 3,000, for a week or ten days, and a suppository containing iodoform (five grains) after each douche for the first three days.

For abdominal sections the pubic hair should be shaved beforehand, the skin of the abdomen thoroughly cleaned by scrubbing, and the umbilicus cleaned out with liquor potassæ. A compress soaked in perchloride of mercury, 1 in 2,000, is then kept on the abdomen for at least six hours. Immediately before the operation the skin is treated with lysol, and then alcoholic solution of iodide of mercury, like the operator's hands.

Preparation of Instruments.—For sterilization of instruments, boiling for at least ten minutes, a little bicarbonate of soda being added to the water, has superseded other methods.

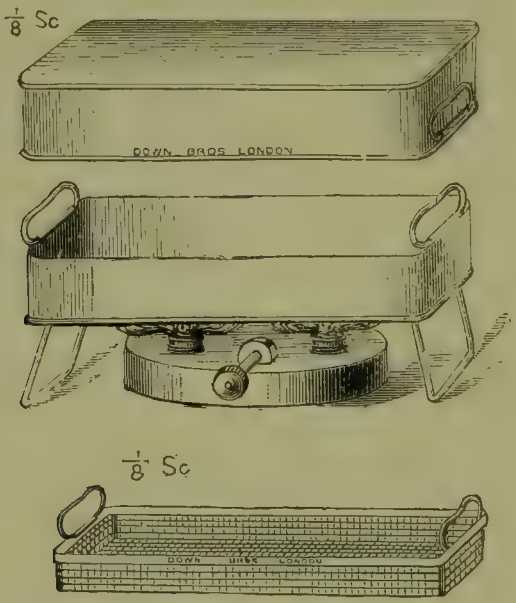

Fig. 60.—Portable Sterilizer for Instruments.

The most convenient portable form of sterilizer, which can be carried in the surgeon's bag, is shown in Fig. 60. After sterilization the instruments may be placed in trays containing lysol, 1 in 80. Sterilized artificial sponges, used dry, are safer than natural sponges, however carefully disinfected; especially for abdominal sections. At Guy's Hospital these are made of bandage cloth, stuffed with cellulose wadding. The pads, as well as towels and overalls, are sterilized by superheated steam at a temperature of 260° Fahr., and a pressure of 20 lbs. to the square inch. During the process the pressure should not be kept uniform, but made to oscillate. The effect is to extract the air from the centre of the dressings, and allow the steam to penetrate more quickly. The sponges are then packed closely in sterilized gamgee tissue, and can be sent to any distance and preserved a long time without contamination. At the operation the packets are opened, so that the operator or his assistant can take up the sponges without touching the outer part of the wrappers.

Sterilization by steam not under pressure, in the upper part of an ordinary sterilizer, is not to be relied upon. It is better to sterilize swabs and towels by boiling in water and use them wet. Steam sterilizers are made for sterilizing by steam at 100° Cent. These consist of cylinders with a double jacket. The steam enters the cylinder at the top from the interspace, and escapes by a tube at the bottom into a condenser. These seem to be satisfactory, provided that the containers for the dressings are fully permeable to the steam, and that they are kept in the sterilizer for at least half an hour after the temperature indicated by the thermometer has reached 100° Cent. The security is, however, not so great that the necessary temperature has penetrated to every part of the dressings, as in the case of superheated steam under pressure.

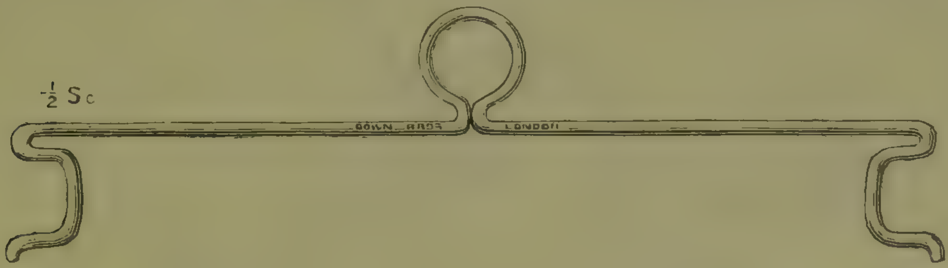

Fig. 61.—Frame for Winding Silk for Sterilization.

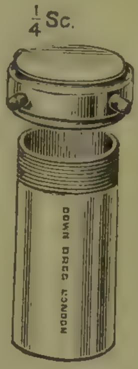

Fig. 62.—Mayo Robson's Cylinder for Sterilizing Catgut in Zylol.

The materials for sutures and ligatures can be carried ready sterilized in tubes, immersed in absolute alcohol or carbolic acid, 1 in 20. But silk can be conveniently sterilized by boiling immediately before operation. It should not be on reels, because then it curls when in use, and the boiling water does not penetrate it so readily. If wound on the frame shown in Fig. 61, the water penetrates it thoroughly, and it does not curl. In abdominal operations, Chinese twist silk, of sizes from No. 1 to No. 4, is sufficient for all requirements, No. 4 being used for pedicles and the largest vessels. Silkworm gut is the best material for sutures which it is intended to remove, and is sterilized by boiling. Carbolic, chromic, and formalin gut are best carried in the glass tubes, in which they can be obtained ready sterilized.

Catgut is difficult to sterilize with absolute certainty, since it is spoilt by being boiled in water. The best plan is to immerse it in a case containing fluid which boils at a higher temperature than water; and to keep this in boiling water for at least half an hour. In Fig. 62, p. 75, is shown a cylinder intended for the sterilization of catgut immersed in this way in xylol. In abdominal operations silk, used with the precautions before mentioned, or gossamer silkworm gut, is more absolutely to be relied upon for buried ligatures or sutures.

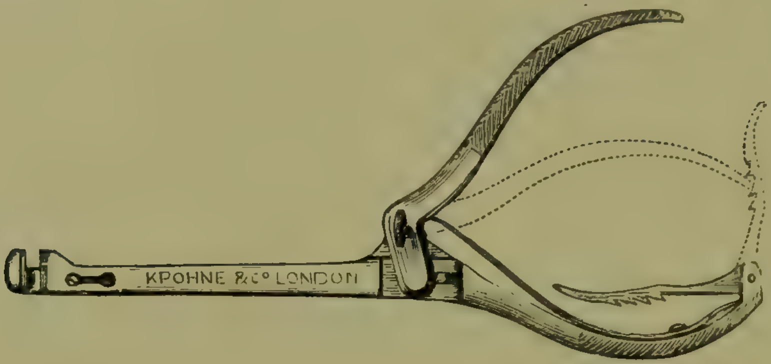

Fig. 63.—HAGEDORN'S Needle-Holder.

Whenever curved needles are required, whether in vaginal or abdominal operations, Hagedorn's needles and needle-holder are the best. The needles are flattened from side to side in the plane of their curve, and are grasped by the holder on these flattened sides. They cannot, therefore, be broken by pressure with the needle-holder; and this is the only form of holder which will hold a curved needle with absolute security against its twisting.

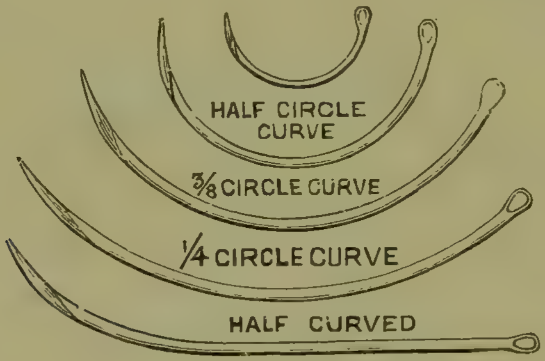

Fig. 64.—HAGEDORN'S Needles.

The shape of the needles also causes them to cut a smaller hole in the tissues, and so cause less bleeding, The traction of the suture is in the same plane as the flat slit which is made, and does not enlarge the slit. Ordinary curved needles, on the other hand, are flattened in the opposite plane. The traction of the suture falls laterally upon the side of the slit, and drags it into a triangular opening.

In the holder shown in Fig. 63 the plane of the needle is at right angles to the straight stem of the holder. Another form of holder is made with an oblique catch and longer stem. This is convenient for use in certain cases of vaginal operation. By inclining the stem obliquely, the plane of the needle can be made parallel to the axis of the vagina. Thus a vesico-vaginal fistula can be sewn together when required in a transverse line of union, each suture being passed sagittally.

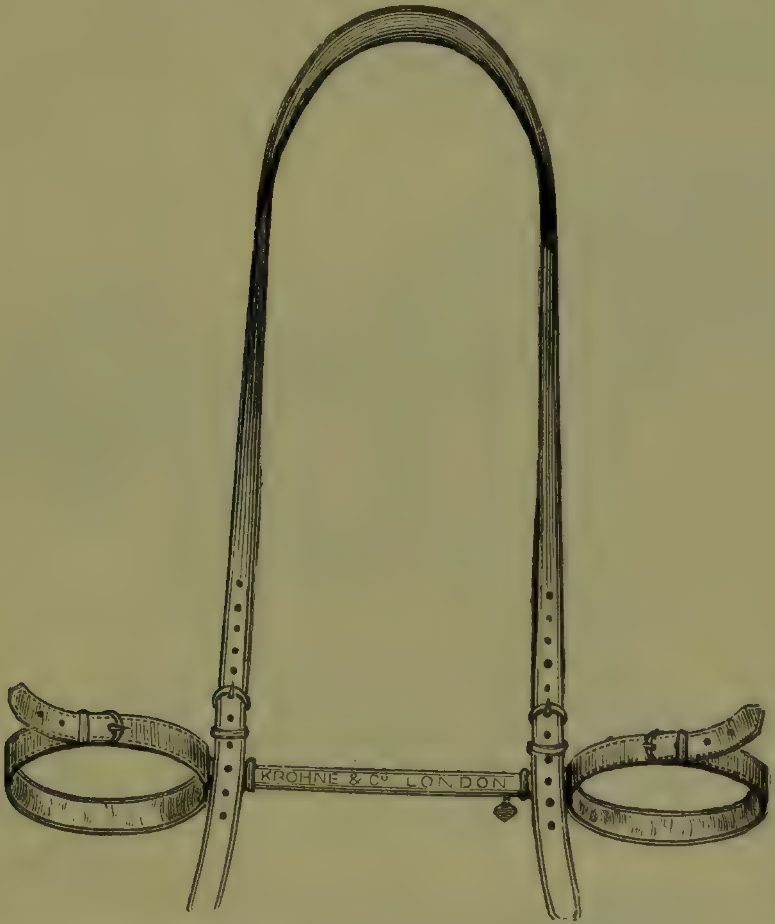

Fig. 65.—Clover's Crutch (the Inner Bar completely slid into the Outer).

In operations on the perineum, and in those on the vagina, performed in the lithotomy or exaggerated lithotomy position, in the absence of a table fitted with leg-rests, such as those shown in Fig. 68, p. 80, the thighs should be secured by Clover's crutch, Fig. 65. By this instrument the thighs, just above the knees, are fixed by circlet straps at the end of an iron bar, the length of which can be regulated by a screw which fixes it in any position. The thighs are then flexed to any required degree by means of a padded strap, which passes from one end of the bar round the neck, and is then attached to the other end. Thus the knees can be kept widely apart while the operation is performed, and brought closer together by altering the screw, when the time arrives, in the case of a perineorraphy, for tightening the sutures. It is generally advisable to pass the strap under one shoulder and over the other to avoid too great bending of the neck, and consequent interference with respiration.

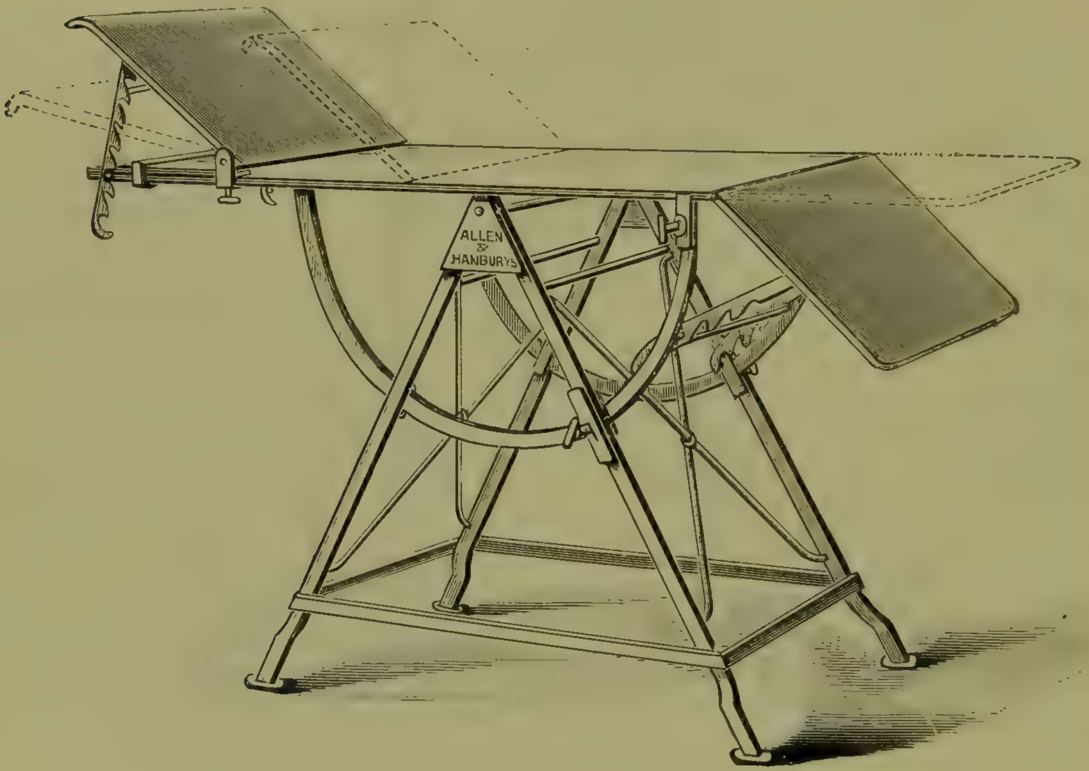

Fig. 65.—Berndt's Operating Table.

Abdominal Operations.—In all abdominal operations the operator should be prepared to adopt the Trendelenberg or elevated pelvic position for the patient, if occasion calls for it. This position renders possible some procedures, such as search for pelvic glands infected by cancer, or shortening of the utero-sacral ligaments, which, without it, would be impossible; and it greatly facilitates all operations in which the pelvic peritoneum has to be united by suture. In most cases an angle of about 30° to the horizon is sufficient; but for special operations, such as those mentioned above, an angle of 45° or more is required.

The position is considered a safe one for the administration of the anæsthetic, as it tends to counteract anæmia of the brain ; but to fulfil this condition, it is essential that the head be lowered so as to lie on the same slope and in one line with the body, and that there be no bending of the neck. The head and face naturally become more congested, especially if ether be administered. This involves a degree of risk in patients liable to cerebral hæmorrhage, especially with high degrees of inclination.

Many expensive operating tables do not allow the Trendelenberg position to be produced perfectly ; as, for instance, if the flap to lower the head is not pivoted on the same plane as that to lower the knees ; if the length from the knees to the head is not sufficient ; or if the table does not allow an inclination of at least 45° to the horizon.

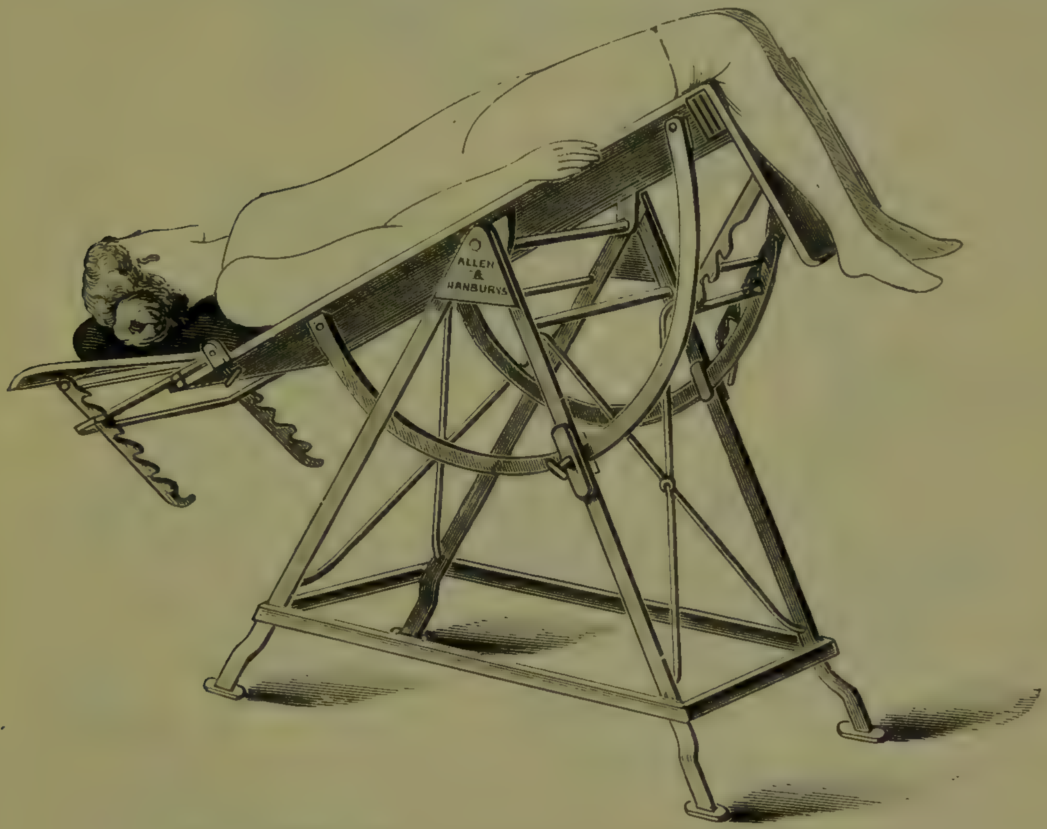

Fig. 67.—Operating Table adjusted for Trendelenberg's position.

A comparatively inexpensive table for the purpose is shown in Figs. 66, 67, 68. Since the table is pivoted on its centre, the operator does not need to stand on a stool when the table is inclined. The inclination can be increased up to an angle of about 65° to the horizon, and can be altered at any moment, without the force required when the patient's weight has to be lifted, to change the inclination. The same table is provided with leg rests, which maintain the lithotomy or exaggerated lithotomy position, at any inclination to the horizon, and without the buttocks being elevated so much as they are if the flap is hinged near the head of the table. This arrangement of leg rests interferes much less with the administration of the anæsthetic than Clover's crutch (Fig. 65, p. 77), in the use of which a strap has to be passed round the neck. When the lateral or Sims' position is to be used, a somewhat wider table is more convenient. When the Trendelenberg position is used at a high angle, a bandage should be passed round the ankles and the flap which supports the legs. Care must be taken that the knees are exactly in the right position, and that the angle of the table under the knees is well padded.

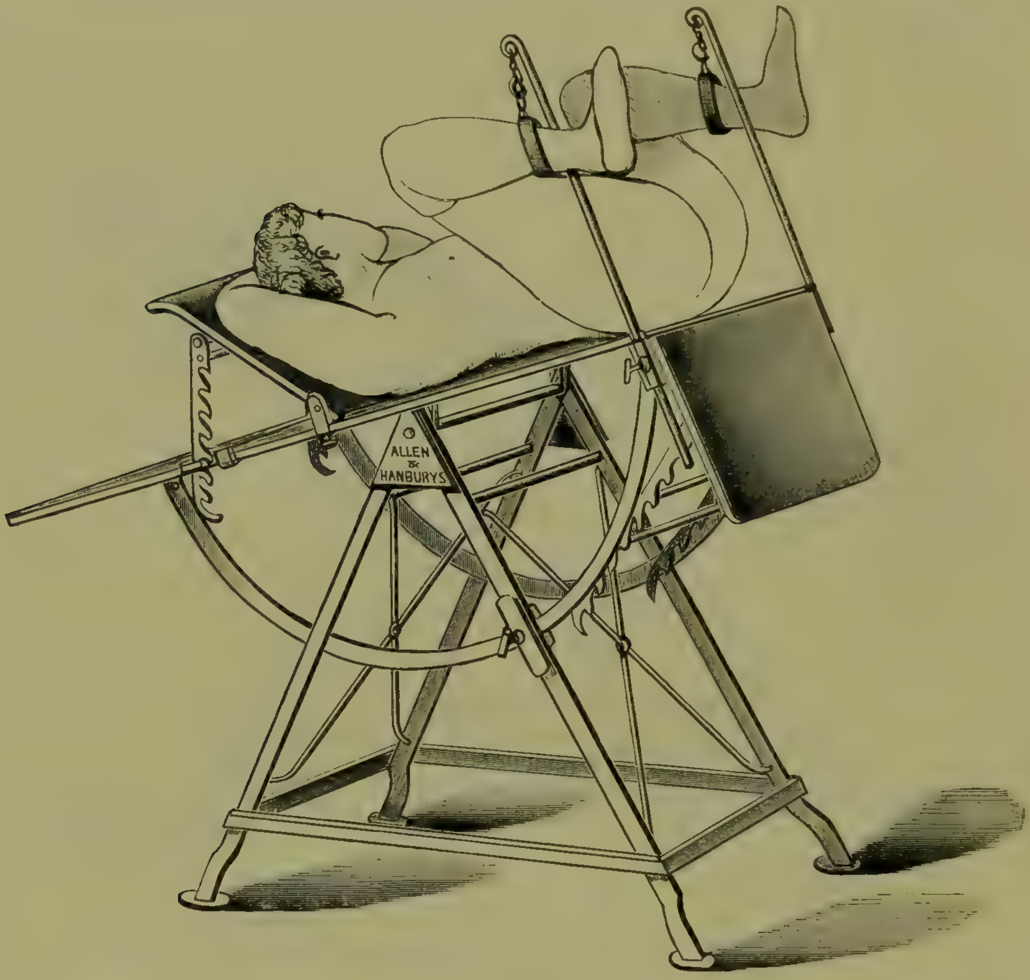

Fig. 68.—Operating Table adjusted for exaggerated lithotomy position.

When it is intended to use the Trendelenberg position, the head of the patient should be turned toward the light, immediately opposite and near to the best window available. It is an advantage also to have overhead a powerful electric light of several burners, since in this position the front of the pelvis is shaded from the light, when a large tumour is turned out of the abdomen. A movable hand electric light to throw its rays into any cavities of pelvis or abdomen is also advantageous.

As a portable frame for the Trendelenberg position, I am accustomed to use that invented by Mr. T. H. Morse, of Norwich, which is shown in Fig. 69. It is made of cycle tubing, and is constructed by Messrs. Holmes, Castle Hill Works, Norwich. It weighs only ten pounds with the case, and is packed into a canvas case, 35 inches long, and 3 inches in diameter. It is thus easily carried in the hand, and placed on the rack of a railway carriage.

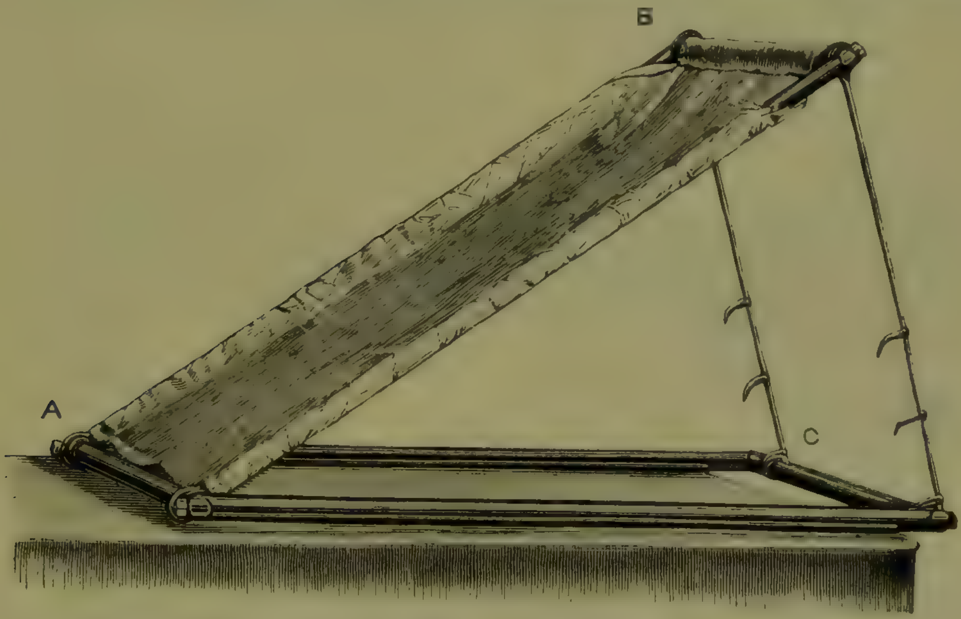

Fig. 69.—Morse's Portable Frame for Trendelenberg's Position.

When the frame is in use, the slope B C, which supports the legs of the patient, is covered with a linen case, as well as the slope A B, which supports her trunk and thighs, and the ankles can be secured to it by a bandage. This cover is omitted in the figure, in order to show the construction of the frame. I am accustomed to use a single cover, covering both slopes A B, B C, which is slipped on from the end C, after the frame is put together, A B C being extended in a straight line, as when the patient lies down upon the frame. The lower ends of the thin rods at C are joined by a transverse rod, which is not seen in the figure. The angle at B, between the two slopes, should be well padded with a folded towel. The case covering the slope A B should be protected by a mackintosh. In the frame as shown, the slope A B is not long enough to fully take in head as well as trunk, except in the case of a short woman. But the neck is not too much bent if a small pad or cushion is placed under the neck, about A. between the slope and the level table. The maximum inclination is 35°. This might be increased up to 45° or more. if the thin rods B C were made longer, but in that case the slope A B would have also to be made longer, so as to include head as well as trunk, even in the case of a tall woman.

When the frame is made to project over the end of the table, as shown in Fig. 69, three inclinations may be used, the hooks at and above C passing through apertures in the cover, and the end of the slope B C coming below the level of the table at the lower inclinations. Otherwise only the maximum inclination, which is generally the most useful one, can be used. In lowering the frame with the patient upon it, care should be taken that her hand does not get nipped between the rods A B and A C.

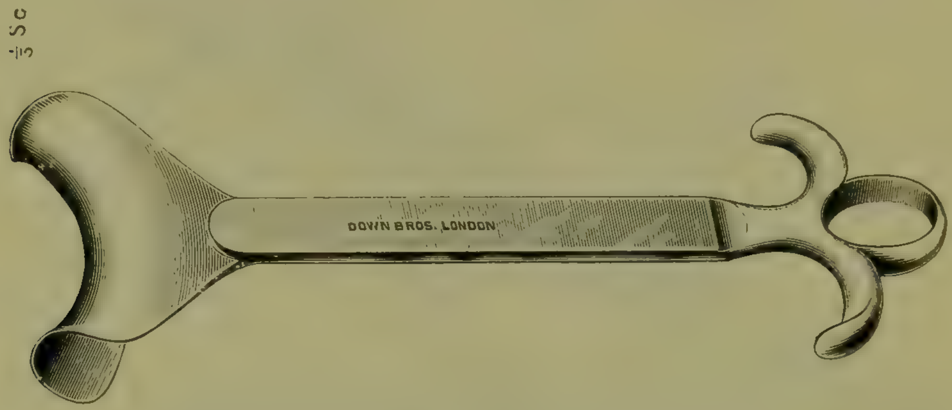

Fig. 70.—Doyen's Retractor for Abdominal Section.

In connection with Trendelenberg's position, and even without it, much advantage may be derived from Doyen's abdominal retractor (Figs. 70 and 71), which keeps its position without requiring an assistant to hold it. If of full size, it requires a fairly long incision, nearly as high as the umbilicus, and not far short of the pubes.

The blade is placed centrally, at the lower angle of the abdominal wound, which it expands laterally, its convexity towards the pubes, and its lower margin within the peritoneal cavity. Its polished surface reflects the light into the pelvis. The handle lies above the groove between the thighs. As the instrument is shown in Fig. 70, the handle may simply be held by an assistant. For automatic retention, the curving branches shown in Fig. 71 are placed in position between the thighs before the operation is begun, the outer ends of the fenestræ curving down underneath the thighs. When the blade is placed in position the handle is slipped into the groove, and held firmly by the screw in the desired position. Where a long incision is required, forceps of the form shown in Fig. 72, p. 84, act very well as retractors. Each forceps is used to grasp the edge of peritoneum muscle and fascia together; and two forceps may be used at each side of the incision. The edge of the lysol towel may be included in the forceps so as to prevent exposure of the skin. The same forceps are useful for tying vessels.

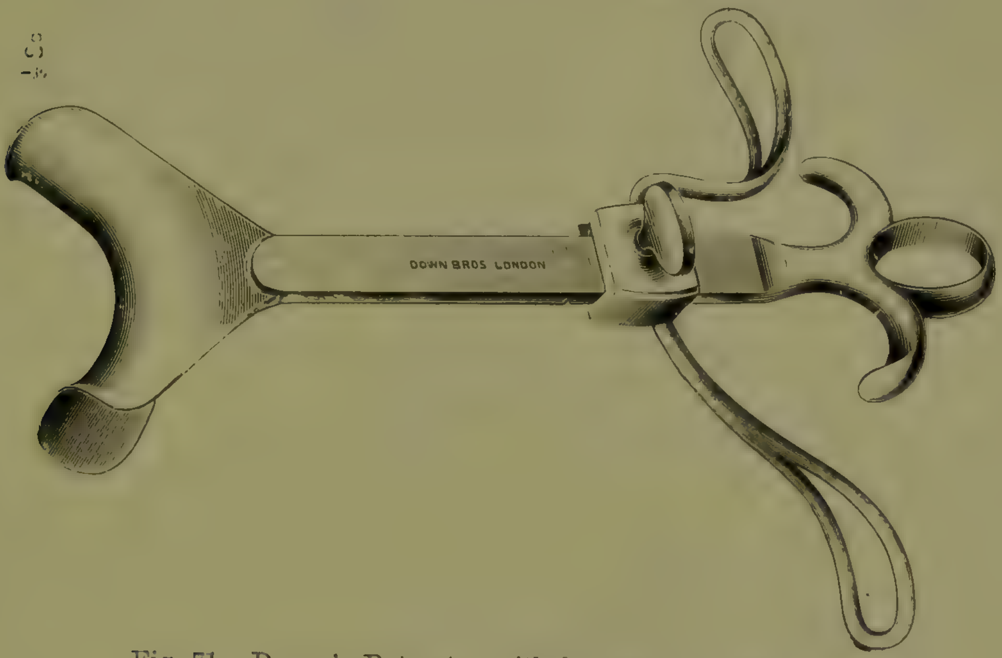

Fig. 71.—Doyen's Retractor with branches for fixation.

For avoidance of shock in severe abdominal operations the chief requisites are that the hæmorrhage should be limited, that the intestines should be exposed as little as possible, that the patient should be kept well covered from chill, and that there should be a skilled anæsthetist, who does not give more anæsthetic than necessary. It is generally advisable to give some ether in the early stage; but later, especially if there is a difficulty in securing adequate muscular relaxation, or there is much mucus in the bronchi, it may be advantageous to change to chloroform, A C E mixture, or mixture of one part of chloroform to two of ether. Under these circumstances. there is often no appreciable shock after an operation of two or even three hours' duration; but it is of course also of importance not to spend any unnecessary time in the operation.

The operating room should be warm, but no extreme temperature is needed. A temperature from 65° to 70° Fahr. answers the purpose. Operating tables are sometimes made with hot-water tubes to preserve the patient's heat, but I have never found these necessary.

If there are symptoms of shock at the end of the operation, an enema of half a pint of strong coffee may be given as soon as the retching which often follows upon the coming round from the anæsthetic is over. This may be followed at intervals by enemata of normal saline solution; common salt, 60 grains to the pint. In cases of collapse from hæmorrhage, or of very severe shock even without much hæmorrhage, normal saline solution should be injected into a vein at the bend of the elbow. This may be done by an assistant during the operation. But, unless in extreme emergency, it should not be done until the bleeding vessels have been secured, otherwise more blood may be washed out of the vessels than would otherwise have been lost.

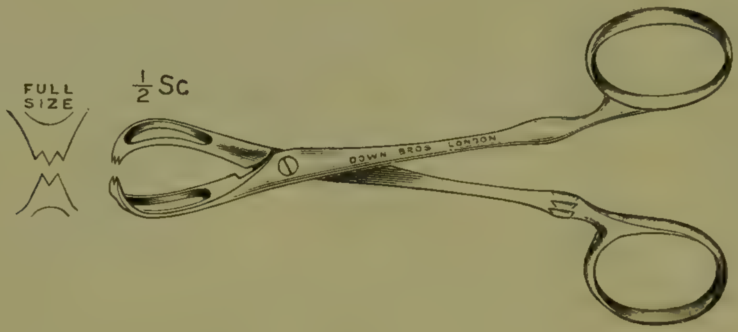

Fig. 72.—Lane's Tissue Forceps.

In Fig. 73 is shown a convenient apparatus for intra-venous injection. The most prominent vein is exposed by an incision, and two ligatures placed around it by an aneurism needle, with an interval between. The distal ligature is tied up. The vein is opened between the ligatures, and the canula, which ends in a round extremity, is slipped in, and the ligature tied temporarily around it by a single hitch. At the end of the injection the ligature is tied up tight with a double hitch, the incised piece of vein cut out, and the external wound closed.

The saline solution should be in boiled water. Sterilized tabloids of salt ready prepared may be carried for the purpose. In the absence of these, the salt may be sterilized by heat, in a spoon over the flame of a spirit lamp, or may be added to the water before it is boiled. From two pints to four pints or more of the solution may be injected when there has been considerable hæmorrhage.

Incision of Abdominal Wall.—A mackintosh is placed over the blankets which cover the legs, and upon this and rolled around its upper edge a lysol or sterilized towel. Similarly, another towel is rolled around the lower edge of a mackintosh over the chest. The interval between is covered by another large lysol or sterilized towel having a long slit in its centre, which may be curtailed by sterilized safety pins. Thus as little as possible of the skin is exposed. These towels are replaced by fresh ones if soiled by fluids such as that from an ovarian cyst.

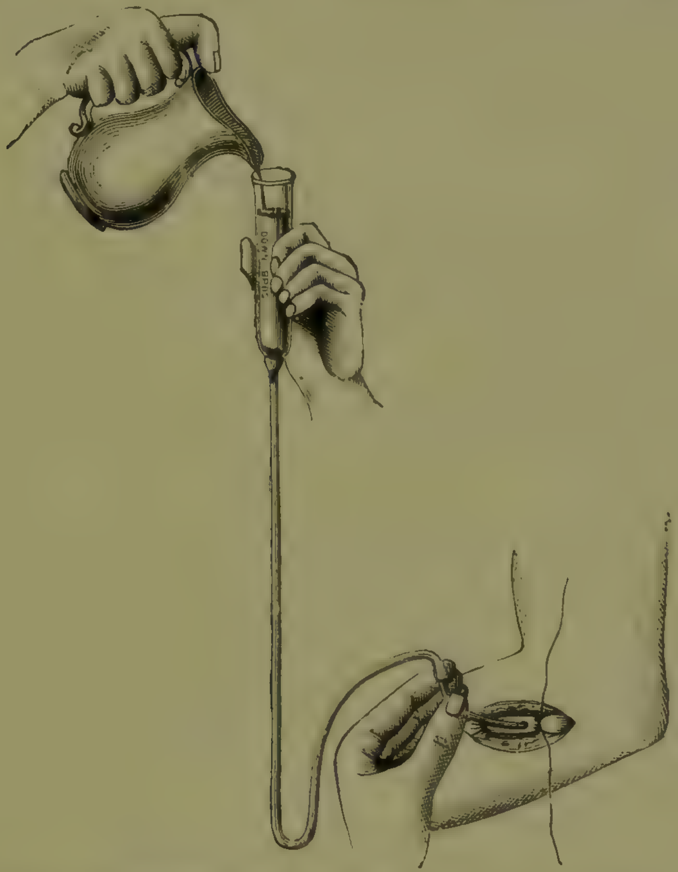

Fig. 73.—Horrocks' Apparatus for intra-venous injection.

For gynæcological operations, it is preferable as a rule to make the incision through the linea alba. Some operators, to diminish the chance of ventral hernia, prefer to incise through the fibres of one rectus, or through the linea semilunaris. But ventral hernia can be avoided by the methods of sewing up hereafter to be described. The central incision not only causes less hæmorrhage, but avoids the division of nerves, which would weaken the muscles which they supply.

If intestines are lying under the line of incision, care is required not to injure them in opening the peritoneum. When the subperitoneal fat is reached, the tissue is seized with pressure forceps at each side, and drawn upward while the incision is made. There is greater security if the Trendelenberg position is used, for then the intestines, unless adherent, fall away backward the moment the peritoneum is incised, and air allowed to enter. In case of intestines adherent to the abdominal wall, as they may be from chronic peritonitis, or after a previous abdominal section, very careful dissection is required. Sometimes the bladder lies high up under the abdominal wall, nearly up to the level of the umbilicus, although emptied. This is especially the case when there is some mass behind the cervix, such as fibroid tumour, hæmatocele, or encysted peritonitis, pushing the uterus upward and forward. In such case, the peritoneum should be opened high up, nearer the umbilicus than the pubes, and, in case of doubt, the limits of the bladder explored by a uterine sound passed through the urethra. The vicinity of the bladder is revealed to the operator by his coming upon a dense red muscular tissue, which bleeds more freely than the rest of the abdominal wall.

Irrigation of the Peritoneal Cavity.—Some years ago many operators preferred to remove blood and clots by washing out, rather than by mopping. With the use of sterilized artificial sponges, it is better to avoid irrigation in most cases; for, though the water be boiled, it is more difficult than in the case of the sponges to make it certain that it does not get some contamination from the vessels or tubes through which it passes, or the persons handling it.

Especially in septic cases, the object should be to keep any escape of septic fluid limited by packing sponges round; and then to mop it up, and mop over afterward with an antiseptic, such as formalin, 1 in 500, rather than to use any irrigation which might diffuse septic microbes throughout the peritoneum.

Howard Kelly, however, adopts an opposite plan, and advises that, when septic fluid has escaped, a quantity of normal saline solution should be left in the peritoneal cavity, and the foot of the bed elevated so as to promote absorption in the upper parts of the peritoneal cavity, near the diaphragm, which are said to be more active in this respect.

Irrigation is useful if a non-septic fluid, such as ovarian fluid, has got into the peritoneal cavity; if blood and clots are very widely diffused, as from an intra-peritoneal hæmorrhage; and, finally, if a septic fluid has become widely diffused over the peritoneum, or there is already a general septic peritonitis. In the two last cases the irrigation must be very thorough, with a large quantity of fluid, and drainage must be used afterwards.

Antiseptic solutions, such as those containing boric acid or iodine, have been used for peritoneal irrigation; but the present belief is, that it is better to trust to the germicide power of the peritoneum itself; and, in order not to impair this, to use the least irritating fluid, namely, normal saline solution, gr. lx. ad Oj. If there has been much hæmorrhage, it is an advantage to leave some of this in the peritoneal cavity for absorption. The temperature may be about 100° Fahr.

If a long incision has been made, the irrigating fluid may be poured from a jug, and this is the quickest method in such cases. Otherwise a large funnel or irrigator should be used, connected by rubber tubing with a metal delivery tube. Lawson Tait's tube, Fig. 74, is commonly used for this purpose. An improvement on it is Morse's irrigating tube, Fig. 75, p. 88, consisting of two such tubes united side by side. A return current to the surface of the abdomen is thus allowed, and there is less tendency of the fluid to wash the intestines out through the abdominal wound. The irrigation should be continued till the fluid returns clear, or only slightly tinged with blood.

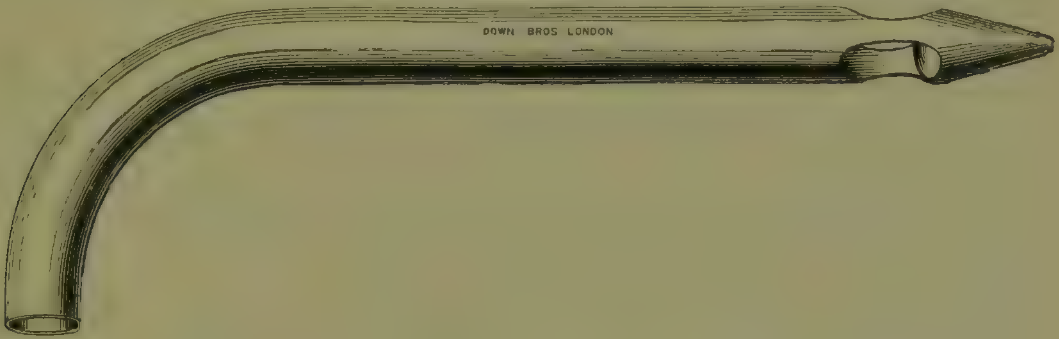

Fig. 74.—Lawson Tait's Irrigating Tube.

Drainage of the Peritoneal Cavity.—The earlier extension of abdominal surgery was much aided by drainage of the peritoneal cavity in cases in which extensive adhesions were separated, and a considerable effusion of sanguineous serum was expected. At present, with modern improvements of antisepsis, and the more complete hæmostasis permitted by the Trendelenberg position and a fairly long abdominal incision, the tendency is to limit drainage more and more.

Drainage is still imperative if an abscess cavity is laid open, such as a perimetric abscess, the walls of which cannot be removed or isolated from the peritoneal cavity. It is hardly ever now required on account of hæmorrhage, except in some cases of operation for extra-uterine fœtation with an adherent sac, especially if the fœtus is living at the time of operation. It is advisable if virulent septic fluid has got into the peritoneal cavity, and there is reason to expect a considerable sero-sanguineous exudation from separated adhesions, which would afford a nidus for the multiplication of microbes, especially if a large part of the peritoneal surface has been damaged. Doubtful cases are those in which pus has escaped into only a limited part of the peritoneal cavity. In such cases the decision should be made according to the probability of a virulent character in the pus. If the inflammation dates from a septic infection after delivery or abortion, and pyrexia existed at the time of operation, drainage is advisable. If the pus is attributable to a gonorrhœa of a long-bygone date, and symptoms have been quiescent, the abdomen may often be completely closed, with a good result.

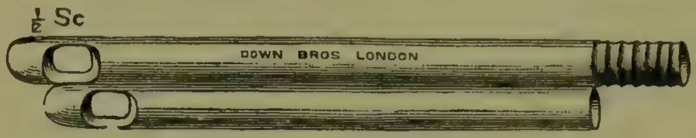

Fig. 75.—Morse's Irrigating Tube.

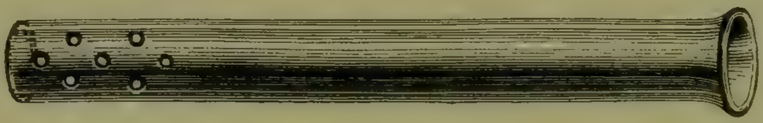

Fig. 76.—Keith's Drainage Tube for Ovariotomy.

The original method of draining was by Keith's drainage tube of glass, Fig. 76. A tube is chosen of such a length that its lower extremity will rest at the bottom of the pouch of Douglas, while the top projects just above the gauze placed over the abdominal wound. The tube is adjusted at the lower angle of the abdominal wound, or rather higher up, between two of the stitches, if it lies more conveniently in that situation. The rest of the wound is closed in the usual way, one stitch being left at the site of the tube, to be tied up when the tube is withdrawn.

In Lawson Tait's tube, the lower end is rounded, and the whole tube perforated with holes, to avoid the risk of an accident which has sometimes occurred, namely, that a piece of intestine has been nipped under the end of the tube, and a fæcal fistula has been produced. This pattern does not allow any small clots or shreds to be drawn out through the tube. It should, however, be used if the plan is ever adopted of removing one or two stitches at a time subsequent to the operation, for the introduction of a drainage tube; for then the tube cannot be adjusted by the fingers to the bottom of the pouch of Douglas, free from any intestine. If Keith's tube be used, care should be taken that the lower margin is well rounded, and not sharp.

The tube is managed as follows: a sheet of thin pure india-rubber, about eighteen inches square, has a small hole cut in its centre, by means of which it is fitted tightly over the upper end of the tube. A sterilized pad, or pad of folded cyanide gauze or other antiseptic material, squeezed out of perchloride of mercury solution, 1 in 1,000, is placed over the top of the tube, and the india-rubber sheet wrapped over it. The wound is dressed by placing over it two cyanide gauze dressings, one slit centrally one-third its length from the bottom, the other two-thirds its length from the top. The latter is first adjusted from below, then the former from above, so that they encircle the tube and overlap each other. The gauze is secured by strapping, and then a many-tailed bandage, one of the tails passing close to the tube at each side. The top of the tube with its pad and rubber covering is kept in place by a broad band passed underneath the abdominal bandage, and secured separately.

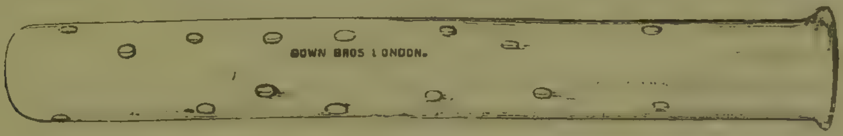

Fig. 77.—Lawson Tait's Drainage Tube.

In this way the tube and its contents should be kept aseptic. The fluid is sucked out from it by means of a piece of thin india-rubber tubing attached to a glass syringe. The syringe and tube should be kept carefully sterilized, and all precautions should be used for the sucking out, as for an operation, the site of the tube being surrounded by lysol towels. The sucking out should at first be at intervals of two or three hours, later at long intervals, but it is better that the tube should not be allowed to overflow. The gauze dressing is not disturbed at the sucking out, but it is advisable to change it at about twenty-four hours after the operation, as sanguineous fluid may have soaked into it by the side of the tube, during the early vomiting.

The tube should be kept in until the serum is clear and free or almost free from blood. This will generally be after an interval of from one or two, to five, or even seven days. If the fluid becomes thick, purulent, or offensive, the tube may be washed out by injecting two or three drachms of antiseptic fluid by the syringe, sucking it out again, and repeating the process till it returns clear. If the discharge does not become serous and clear by the end of seven days, it will generally be necessary to replace the glass tube by a rubber drainage tube, and only shorten it gradually as the sinus closes from the bottom. It is possible still to wash out in the same way by fitting a narrow gum-elastic catheter to the syringe, and passing it down the tube. Sulphurous acid, 1 in 20, answers well the purpose of thus washing out.

The use of Keith's drainage tube has the disadvantages that it leaves a weak spot in the cicatrix which may become the site of a ventral hernia; that it casts the responsibility of antisepsis on the nurse who sucks out the tube, more than upon the surgeon; and that, if suppuration occurs, a sinus is apt to remain which it is very difficult to close.

Some prefer to pass a strip of iodoform gauze down to the pouch of Douglas instead of the glass tube, with the idea that it sucks up the fluid by capillary attraction like a wick. This action, however, when in opposition to gravity, is not altogether satisfactory in evacuating the whole of the fluid, and the gauze drainage obviates only the second out of the three disadvantages above mentioned. Moreover, the gauze appears to set up adhesions more than the glass tube. I have had occasion to open the abdomen again after some years' interval, when a glass drainage tube had been kept in for ten days, and have found the pouch of Douglas and the peritoneum generally entirely free from adhesion.

Of late years I have given up the use of Keith's glass tube almost entirely in favour of drainage with a strip of iodoform gauze through the pouch of Douglas. This drainage has the aid of gravity; and, with the aid of Trendelenberg's position, it is not difficult to open the pouch of Douglas. The intestines are kept back with a large pad. An assistant pushes up a pair of forceps from the vagina into the posterior vaginal fornix, and opens the blades somewhat. The operator incises the vagina from the pouch of Douglas with scissors between the blades, and enlarges the opening till the index finger can pass through it. A long strip of moist sterilized iodoform gauze, 10 per cent., of corresponding thickness, is prepared and passed from the abdomen through the opening. The assistant seizes the lower end and draws it down through the vagina. About the upper half-inch of the strip is left projecting into the peritoneal cavity of the pouch of Douglas. The remainder is packed into the vagina; and it will generally be necessary to add an additional strip so as to fill the vagina moderately. The drain may be left in place two or three days. The vagina is plugged lightly with similar gauze up to seven or eight days, the plug being changed every other day.

If not only drainage, but plugging of the retro-uterine fossa of peritoneum is required, a wider opening must be made across the vault of the vagina, or the whole uterus be removed, and a larger quantity of gauze used. In this case it is necessary, when the first gauze is removed, to replace a plug through the vagina into the peritoneal cavity, and to let the cavity which has been plugged only close gradually from the top. Care must be taken not to let the vaginal opening close prematurely.

If adhesions prevent access to the pouch of Douglas, I consider a Keith's glass drainage tube, placed in the lowest fossa accessible, to be still the best mode of drainage. The existence of a septic or gonorrhœal endometritis would be a point against vaginal drainage, unless the uterus is removed.

A plug may also be applied from the abdomen into the pelvic cavity. This is hardly ever required to arrest hæmorrhage, except in some cases of extra-uterine fœtation when the fœtus is alive, or very recently dead at the time of operation. It may be used to keep back the intestines out of a cavity which it is desired to drain, such as that of a perimetric pelvic abscess, of the sac of a serous perimetritis, of an extra-uterine fœtation which cannot be stitched to the abdominal wall, or of an extra-uterine placenta which cannot be removed. It is best used in the form of the so-called Mikulicz tampon. This consists of a bag of gauze, large enough to reach to the bottom of the pelvis, and project outside the abdominal wound. It may be made by running a purse-string suture round the edge of a circular piece of gauze of suitable size. It is recommended that a thread be attached to the centre to aid in the removal of the bag, but this is not essential. The bag is packed with strips of gauze until the pelvis is filled. The bag allows them to be easily withdrawn and replaced at 48 or 24 hours' interval, so long as the plug is required, and until the intestines have become united and shut off by adhesion. A Keith's tube may be passed into the centre of the plug to allow sucking out of fluid from the pelvis. A sufficient opening must be left at or near the lower angle of the abdominal wound to allow the ends of the several strips to project and the gauze to be changed.

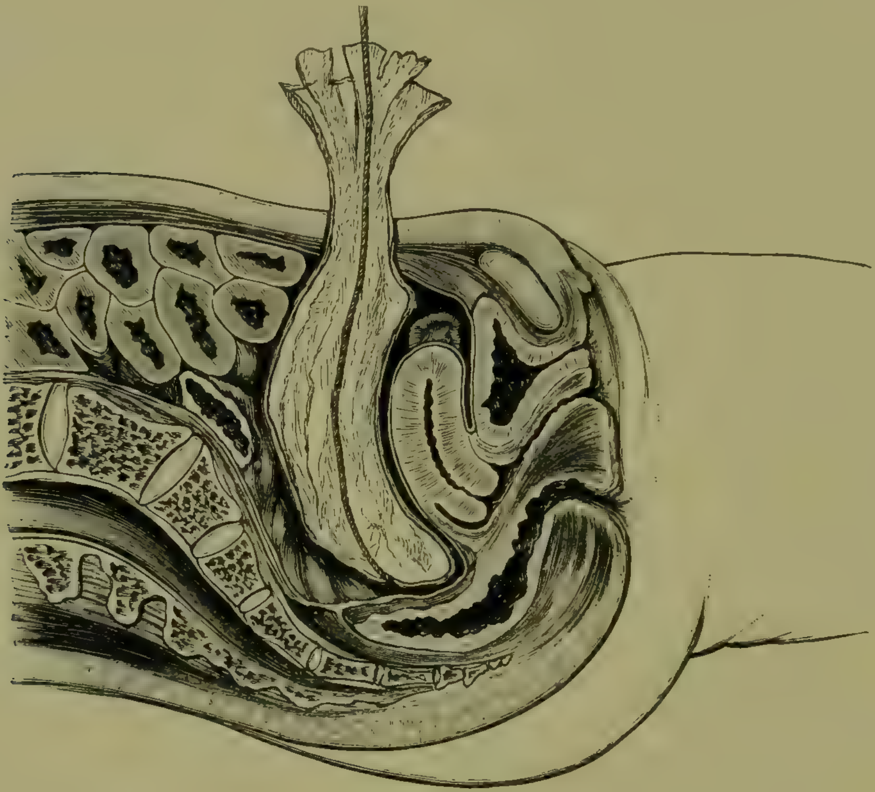

Fig. 78.—Mikulicz' Tampon

When any form of abdominal gauze drain is used without a tube or sucking out, it is advisable to place the patient occasionally in the lateral position, on each side alternately, that gravity may not constantly be adverse to the drainage.

Toilette of the Peritoneum.—At the end of an abdominal section. all blood and clots must be carefully mopped out, not only from the pouch of Douglas, but from the anterior fossa. If there has been any bleeding or escape of fluid above the pelvic brim, or if there was prior to the operation any effusion in the peritoneal cavity, artificial sponges on sponge forceps should also be passed down to dry thoroughly also the lumbar fossæ of peritoneum.

Closure of the Abdominal Wall.—The commonest inconvenient sequela of an abdominal section is the subsequent occurrence of a ventral hernia, and the chief point to be aimed at in closing the abdominal wall is to render this impossible.

The structure most to be relied upon for the prevention of ventral hernia is the fascia superior to the recti, forming the anterior sheath of those muscles. Unless it has separate sutures for itself, this fascia never does unite satisfactorily, since it is retracted laterally through its connection with the oblique and transversalis muscles. The stronger and more vigorous is the patient, the more marked is this retraction.

The favourite mode of uniting the abdominal wall at present is to use three tiers of sutures, the two lower tiers buried: the lowest for the peritoneum, the middle for the muscle and fascia, the upper for the skin, or skin and fat. To carry out the principle perfectly, there ought to be four tiers, the muscle and the fascia having each a tier to itself. For the buried sutures either fine silk or catgut is used, and most operators prefer the latter, for fear that the silk may become septic and reappear later.

By the following method I believe that a better union is obtained by three sets of sutures, one only being buried. The first set consists of interrupted sutures of stout silkworm gut, and is passed through everything, including peritoneum, muscle, fascia, subcutaneous fat, and skin. Straight needles, 4 inches long, are used. The needle is first passed from the skin inwards on one side, and then from the peritoneum outwards on the other. Or each suture may be threaded with a needle at each end, and both needles passed from within outwards. It is a good plan to make the border of peritoneum wider on one side than the other, so that a band of union, partly sero-serous, partly sero-fibrous, is secured. The sero-serous union is the quicker, the sero-fibrous the firmer, and less easily separated. The width of peritoneum included should be from ¼-in. to ½-in.

Before the application of the first set the operator places a flat pad, of suitable size, under the abdominal wall, to keep back intestines and catch any blood which flows from the punctures. A pair of catch-forceps is attached to it, to remind him that it has to be withdrawn.

The second set consists of a continuous buried suture uniting the fascia superficial to the recti. After considerable trial of fine silk and catgut, I have found the best material for this to be gossamer fishing gut, which may be obtained in pieces 18-in. long. Even if pus reaches this from a stitch abscess it does not infect the whole length of it, as is the case when a buried continuous silk suture is used.

If the muscles do not seem to be coming well together, a loop of the suture now and then is passed more deeply, so as to include the edge of the muscle on each side. In general, the union of the fascia approximates the muscles, to which the fascia is attached, and the deep sutures, including the muscles, complete their union when they are tied up.

In some cases the edges of the muscles are widely separated beforehand by previous pregnancies or extreme distension by a tumour. In such cases the only way of uniting the muscles is to remove the redundant part of the abdominal wall, till their edges are reached. Even if this is not done, the union of the fascia prevents any localized ventral hernia, although there may be bulging of the whole centre of the abdominal wall between the recti.

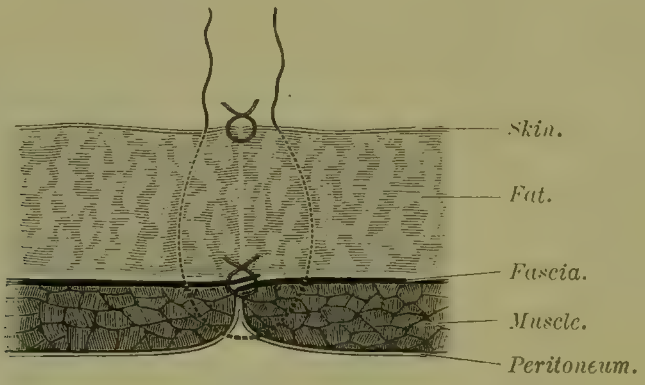

Fig. 79.
Author's Method of placing sutures to unite Abdominal Wall.

When the buried suture is nearly completed, the pad is extracted from beneath the abdominal walls. The ends of the deep sutures are at the same time drawn up tight to prevent any risk of the intestine being nipped between the peritoneal edges.

Finally, the skin is united by a continuous suture of horsehair, which passes beneath the loops of the deep sutures. Intermediate superficial interrupted sutures of horsehair or fine fishing gut answer equally well to unite the skin.

Fig. 79 shows the relation of the three tiers of suture in a transverse section passing through one of the deep sutures. For the sake of clearness, the deep suture is represented as still untied, although it is really tied up before the superficial continuous suture is applied. The deep sutures may be removed nine days from the operation, the superficial suture two days later.

It is possible to stitch together both the peritoneum and the fascia without using any buried sutures at all. This is effected by a kind of mattress suture, which has been introduced by Dr. Horrocks. Interrupted sutures are used. On one side, say on the right, the needle is passed from without inward through skin, fat, fascia, muscle, and peritoneum, and then through the peritoneum of the left. It is then passed from within outward through the peritoneum of the left, and through peritoneum, muscle, fascia, fat, and skin of the right. On the left-hand side of the wound the needle is passed from without inward through skin, fat, and fascia of the left, then through fascia of the right. It is passed back from within outward through fascia of the right, and then through fascia, fat, and skin of the left. In this way both peritoneum and fascia are united in overlapping layers. There is the drawback that these sutures unite only the peritoneum and the fascia, and that there is no suture encircling either muscle or fat. This disadvantage might be avoided by placing between each pair of mattrass sutures a suture from side to side passing through everything.

The wound may be covered either by a sterilized pad of suitable size, or by a dressing of cyanide gauze. In the latter case the layers of gauze next the skin should be moistened with perchloride of mercury, 1 in 1,000. This dressing is secured by strapping. Over this more pads or layers of gamgee tissue are placed, and over all a many-tailed bandage is secured. If the temperature remains normal, the dressing need not be changed until the sutures are removed. If there is any rise of temperature, after the usual slight initial rise, especially if it occurs from the fourth day onward, the dressing should be changed, and the wound examined. In removing a deep suture the surgeon should seize the ends with forceps and draw them up. He then passes sharp-pointed scissors under the loop, and depresses the skin somewhat with the point of the scissors, so that he divides the suture at a point which has been buried in the tissues. In withdrawing the suture, he inclines the direction of traction across the line of incision, so as to draw the tissues together, rather than tend to separate the edges of the incision.

Complications of Operation.—*Injuries to Intestine.*—If the outer wall of an intestine is torn in the separation of adhesions, fine sutures should be applied approximating the peritoneum. If the tear is complete, sutures should be applied including the muscular wall, but not the mucous membrane. Outside these, another row of Lembert's sutures should be used, including the peritoneum only, piercing the peritoneum twice on each side.

It may be necessary, in a gynæcological operation, to resect a piece of intestine, as, for instance, when there is a localized extension of cancer to intestine. As this has generally to be done as an addition to an otherwise long and difficult operation, it is important to choose the most rapid method of doing it. This is by the use of Murphy's button (Fig. 81). The piece of intestine is first squeezed empty of contents, and then clamped at each end with Lane's intestinal clamp. In the application of this, the pin is passed through the mesentery close to the intestine, and the india-rubber is then stretched over it so as to compress the lumen of the intestine without injuring it. Sponges having been packed round, the affected part of the intestine is then excised: with a wedge-shaped piece of mesentery corresponding.

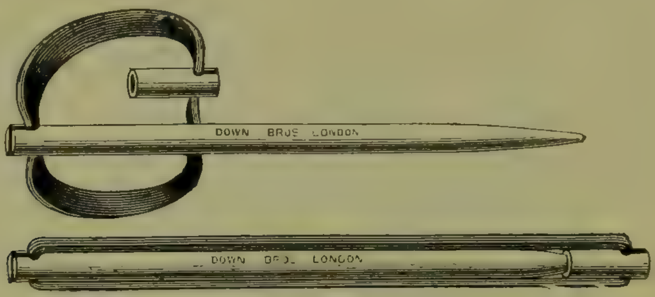

Fig. 80.—Lane's Intestinal Clamp.

A purse-string suture is passed round the open end of intestine. One half of the button is seized by the projecting tube with pressure forceps. The broad end is passed into the intestine, the purse-string suture is tightened till the edge of the intestine lies close around the tube, and then tied. The other half of the button is fixed in the same way in the other open end of intestine. Then the forceps are removed, and the two halves of the button are pressed as firmly as possible together. Finally, the cut edges of mesentery are stitched together. A few fine sutures may be applied to the united peritoneal edges around the button, but this is not essential.

The mechanism is that the edges of intestine compressed by the button slough. But before they separate, the two parts of intestine have become united along the edge where their peritoneal surfaces come into contact. Eventually the button separates and is passed per anum, meanwhile allowing a passage through its tube.

For the successful use of Murphy's button it is essential that its spring should be in good working order. The button must not be too large. The size shown in the figure is the maximum size for small intestine. Most important of all, the edges of peritoneum must be completely inverted where the two halves of the button come into contact.

Injuries to Bladder.—In case of a tear of the bladder, one set of sutures should be applied to the muscular wall, not including the mucous membrane; and a second set of Lembert's sutures to unite the peritoneum. For the former, chromic catgut may be used with advantage. It is advisable to keep the bladder drained for a week or ten days by Skene's self-retaining catheter.

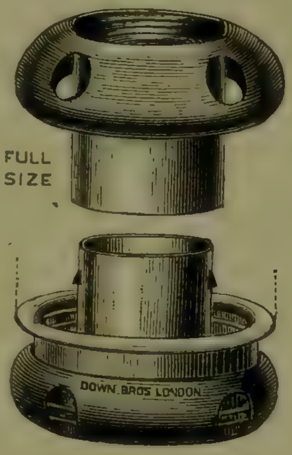

Fig. 81.
MURPHY'S Button.

Injuries to Ureter.—The ureter has sometimes been torn in enucleating a tumour from the cellular tissue, or a piece of it cut away. A part of the ureter may also slough after operation, if it has been separated from its natural connections, and its vessels interfered with.

In the case of a lateral tear to the ureter, the rent may be stitched up. If a piece has been cut or torn away, the injury may be repaired, either by uniting ureter to ureter, or by implanting the proximal end of the ureter into the bladder. To accomplish the former, the distal cut end is tied. A suture of gossamer gut or thin catgut is passed laterally through the wall of the proximal part near the end, and it will obtain a firmer hold if it just enters the lumen. The two ends of this suture are threaded each on a curved needle. A longitudinal opening is cut in the distal part of the tube close to the tied end. Each needle is passed in at this aperture and out through the wall of the tube about half an inch lower down. Traction on the ends of the suture invaginates the proximal end of the ureter through the lateral opening into the distal end, and then the suture is tied. Finally, some sutures are passed superficially to adjust the edges of the opening round the proximal end.

Insertion of the ureter into the bladder is carried out in a somewhat similar way. A sound or a pair of fine forceps is passed in through the urethra, and made to push up the bladder wall at the spot most convenient for insertion. A small opening is made by cutting down upon it. A suture having been passed through the proximal end of the ureter, curved needles threaded at each end are passed through the opening into the bladder and out through its wall. The end of the ureter is thus drawn into the bladder and tied there; the peritoneum being adjusted round it by superficial sutures. The distal end of the ureter is tied.

Another way is to draw the proximal end of the ureter into the bladder by fine forceps passed up from the urethra, and fix it by external sutures. This avoids any suture entering the cavity of the bladder. It is well to leave a gauze drain, passing out through the vagina, in case of any temporary leakage.

The invagination of ureter into ureter has led to stricture and the formation of a calculus. This is a point in favour of making the insertion into the bladder, if the severed part is near enough. The ureter should not be inserted into rectum or any other bowel; if this is done, the rectum is irritated, and ascending infection is apt to disorganize the kidney. If a portion has been removed too extensive to allow of repair, the proximal end should be tied, with great care that the ligature is aseptic, as well as the distal end. The kidney will probably atrophy, or may be removed later by the loin, if it gives trouble.

In case of a ureteral fistula remaining, discharging through the vagina or externally, the simplest cure is removal of the corresponding kidney. This may be done without much risk, provided that the other kidney is healthy; and the patient enjoys good health afterwards and regains complete power of excretion, through the hypertrophy of the remaining kidney. If there is any doubt which ureter is affected, the ureters must be catheterized by Kelly's method.

After-treatment in Abdominal Section. It will generally be advisable to give a subcutaneous injection of morphia, gr. $\frac{1}{4}$, with atropia the first two nights to secure rest; but beyond this, the less morphia is given the better, since it tends to promote abdominal distension and prevent the action of the bowels. If, however, a patient complains greatly of pain on coming round from the anæsthetic, a morphia injection should be given then. For about twenty hours after the operation, nothing should be given by the mouth except hot water, one or two ounces at a time. At the end of this time feeds may be commenced, at first only about an ounce every hour, or, if there is a tendency to sickness, two drachms every half-hour. Milk and barley-water, one part to two, or equal parts, may be given at first; or, if this does not suit, Benger's food, made thin, or peptonized milk. Egg albumen is a valuable food, if others are retained with difficulty. It is prepared by beating up the whites of four eggs into a liquid froth and allowing it to stand in a cool place for an hour or more, when the liquid part is drained off, leaving the frothy part behind. Two teaspoonfuls may be given, mixed in two or three tablespoonfuls of water, with a little sugar. After three days, if the patient's condition allows it, such things as jellies, custard, junket, bread and milk, or tea, may be given. At five days, if the bowels have been well opened, fish may be commenced, and chicken soon after.

The bowels should be opened at the end of two or three days. An enema of soft soap and water may first be given. If this does not act fully, three grains of calomel may be given at night and a saline in the morning, if required, such as a Seidlitz powder, taken when the effervescence has subsided. If there is much tendency to sickness, calomel may be given in one-grain doses every hour up to three or four grains.

The catheter will often be required for the first few days, but should be discontinued as soon as possible. A glass catheter, used with special antiseptic precautions, is the best. If the patient can pass her urine herself from the first, it is all the better; but care must be taken that the bladder does not become over-distended.

Nausea and Vomiting.—If the early vomiting is distressing, it is well to give sod. bicarb. gr. xv. dissolved in four ounces of hot water. This generally is returned, and has the effect of washing out the stomach. Thirty grains of bromide of potassium may also be given by the bowel. If vomiting is prolonged, the stomach should be left at rest until it ceases, and the patient fed by nutrient enemata. Peptonized milk may be given, or the following, which becomes peptonized in the rectum: Hot water gruel ℥ij, cold milk ℥ij, Benger's liquor pancreaticus ʒij, bicarbonate of soda gr. x. This should be repeated every four hours. If nutrient enemata are given, it is well to wash out the rectum once a day with soap and water; and, before giving each enema, to pass a rectal tube, to allow any remains of the last to escape. For prolonged vomiting, tincture of iodine, 1-minim doses, or tincture of capsicum, 2-minim doses, may be given by the mouth.

Thirst.—Thirst is often distressing to a patient after abdominal section; especially if she is unable to retain much fluid by the stomach for some time. It may be relieved by giving from time to time per rectum half a pint of warm water, with a saltspoonful of salt dissolved. Howard Kelly advises giving in all cases an enema of one quart of normal saline solution while the patient is still under the anæsthetic. The pelvis is raised somewhat; the fluid is slowly poured into a glass funnel, held three feet above the level of the anus; and the delivery tube is inserted well up into the sigmoid flexure.

Flatulence and Distension.—The movement of flatus in the intestines generally gives a patient some degree of pain. If the flatus does not readily pass per rectum, the rectal tube should be occasionally passed, and may be left in place some little time. The less morphia is required, and the earlier the bowels are made to act, the less are generally the flatulence and distension. In case of considerable distension, the best remedy is a turpentine enema (B.P.), which may be followed by soap and water an hour later, if not returned. In prolonged distension, strychnia, given subcutaneously, is of value.

Pyrexia.—The temperature generally rises nearly to, or slightly over, 100° within the first few days. A temperature remaining over 101° is suspicious of infection of the peritoneum or of the wound. A temperature rising toward the end of the first week is suspicious of suppuration of the wound or stitch abscess.

The patient may generally begin to leave her bed at from eighteen to twenty-one days; and may be fit to travel at the end of twenty-eight days. Another month should be devoted entirely to convalescence; and the full benefits of the operation are often not attained till a year or more has passed.

Complications: *Shock.*—The means for preventing shock have already been mentioned. If symptoms of it are noted during, or shortly after, an operation, subcutaneous injections of strychnia are the most valuable remedy; with intra-venous injections of saline fluid in very severe cases. After the operation, warmth should be applied by hot bottles, with special care not to burn the patient. Enemata may be given, at from three to six hours' interval, of two ounces of brandy, ten grains of carbonate of ammonia, and eight ounces of beef-tea. The head should be kept low, and the foot of the bed may be somewhat elevated.

Secondary Hæmorrhage.—Secondary hæmorrhage may occur from large vessels having been ineffectively tied, from shrinkage of tissues when large vessels have been tied with tissue *en masse*, or from a pedicle slipping partially out of the loop of a ligature, when a tumour has been cut away too close to the loop. Signs of it generally appear within six or twelve hours of the operation, but sometimes at a later date. The chief symptoms of it are a sudden rise in the pulse rate, with diminished force, pallor of skin and conjunctiva, a cold clammy skin, quickened sighing respiration, restlessness, abdominal pain, sometimes vomiting, and a desire to be raised in bed. Hæmorrhage at a somewhat later stage may sometimes be difficult to distinguish from septic peritonitis; but, in the latter case, there will generally have been, at any rate, an initial elevation of temperature.

The only remedy is reopening of the abdomen. As soon as the bleeding vessel has been secured, intra-venous injection of normal saline solution may be carried out. Some of the same solution may be left in the peritoneal cavity, after the blood has been cleared out.

Septic Infection.—Septic peritonitis is most often due to the *Streptococcus pyogenes*; but it is sometimes produced by the staphylococci, and even by the bacillus coli, especially in cases in which the intestinal walls have been damaged, or in which there is paralytic distension of intestines after operation. In mixed infections the streptococcus is the most important organism.

In the earlier stages it is often difficult to distinguish septic peritonitis from the traumatic or plastic peritonitis, which may follow severe operations, or from the pyrexia resulting from the absorption of an effusion containing, perhaps, some toxin. Septic peritonitis generally gives some sign of its existence by the second or third day. The earlier signs may be simply a progressive rise of pulse and temperature, beginning about the second or third day. The gravest symptoms associated with these are progressive distension of the abdomen and vomiting. but sometimes the vomiting only comes on at an advanced stage. A brown or black colour of the matter vomited, from the presence of blood in it, may be seen in the first day or two, from the straining in anæsthetic vomiting, without having any grave significance. If it commences as late as the third or fourth day, associated with other grave symptoms, it generally implies a very bad prognosis. In septic peritonitis, after operation, there is generally constipation, and aperients refuse to act. There may be severe abdominal pain; but in some bad cases of purulent peritonitis pain may be slight or absent. A normal temperature does not always imply safety, if associated with a rising pulse and vomiting, with a distended abdomen; and a sub-normal temperature may indicate approaching death. If temperature is raised there is often some wandering of mind, especially at night, and in the later stages coma may come on.

If a drainage tube has been left in the peritoneal cavity, patients sometimes recover from an apparently desperate condition of streptococcic infection, if treated by antistreptococcic serum, and the washing out of the drainage tube by non-poisonous antiseptics, such as sulphurous acid or chinosol. In this case the discharge can be examined by microscope and culture for streptococci, and the use of the serum guided accordingly.

If the abdomen has been closed, it is generally rather a forlorn hope to reopen it for septic peritonitis; and this procedure should not be lightly undertaken, since alarming symptoms often subside, and the patient recovers. The abdominal wound should be carefully examined for any local suppuration. If sign of such is found, the deep stitches should not be taken out prematurely, lest the peritoneum give way; but the edges of the cutaneous wound should be separated, and a director passed in, at various points if necessary, to allow any pus to escape, after which drainage should be secured, and the abdominal dressings frequently changed.

If signs of any local effusion are found, which can be evacuated either from the vagina or abdomen, such evacuation affords a hopeful prospect; and the more so the later the date after the operation. In doubtful cases antistreptococcic serum may be injected in full doses, 20 to 40 or more c.c. in the day;

distension combated by turpentine enemata, and a purge of calomel administered. If the purgative acts, it is of favourable import.

If it is decided to reopen the abdomen, this should be done in a tentative manner. Two or three of the lowest sutures should be cut, the buried suture divided, and the peritoneum separated. If adherent intestine is found, the finger should be cautiously passed in in the direction of the pedicle, or pelvic suture, in the search for any collection of pus, and a Lawson Tait's drainage tube of glass, or a drain of iodoform gauze, should be inserted.

If intestines are not adherent, but general purulent peritonitis is found, the only chance is to open the abdomen by a long incision. The mass of the intestines is turned out, the pus washed away with normal saline solution, and lymph wiped off the intestines by swabs dipped in the same. If intestines are much distended, they should be emptied by an aspirator, or small incision, and the wounded spot secured by Lembert's sutures. Free drainage should be used, and some antistreptococcic serum may be diffused over the peritoneal cavity.

If intestines are not adherent, and only sanguineous fluid is found in the pelvis, it may be sufficient to insert a Lawson Tait's drainage tube and suck out the fluid, leaving the tube for drainage.

Ventral Hernia subsequent to Abdominal Section.—Ventral hernia may arise at any date up to a considerable number of years after the operation, and forms one of its most inconvenient sequelæ. It may sometimes be checked at a very early stage by the use of a belt with a flat pad to press upon the weak spot. But, as a general rule, the hernia tends to increase, notwithstanding all use of belts and pads; and the only way to restore the patient to perfect comfort and strength is to perform an operation to strengthen the abdominal wall.

The object of the operation should be to obtain a firm union of the recti muscles, since the fascia is likely to have been so damaged and retracted that it cannot be relied upon as a security. Three layers of buried suture will generally be required.

An incision into the peritoneal cavity as long as the original one is generally advisable, and in some instances it must be extended farther to secure sufficient union of the muscles. In making it, care is required not to injure adherent intestine. Any intestinal and omental adhesions must be separated, and any adherent omentum removed which is likely to intervene between the muscles.

The muscles may have been separated above far beyond the limits of the original incision. In this case they should be sought for near the pubes, and traced upward. The border of the muscles is completely laid bare on each side, from end to end of the incision; and the lining of any hernial sac is dissected away.

Any redundant peritoneum is then removed, and the peritoneum united by a continuous suture of fine silk. In this way, the peritoneal cavity is closed during the rest of the operation. I have found it best to unite the muscles by interrupted sutures of gossamer silkworm gut, placed pretty close together, and numerous in proportion to the amount of tension to be overcome. These are tied up as they are placed, and thus bring the muscles gradually into close union, beginning either at the top or at the bottom. When the muscles are united, if any layer of fascia superficial to the recti can be found, it is united by a separate continuous suture of gossamer fishing gut.

Finally, any redundant skin is removed, and the skin and superficial fat united by interrupted sutures of ordinary fishing gut. If any extensive hernial sac remains, running between the muscles and the skin, it is desirable, after removal of its lining, to drain it by a lateral opening and a strand of iodoform gauze.

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CHAPTER IV.

PHYSIOLOGY OF NORMAL MENSTRUATION.

By the term menstruation, or catamenia, is understood a hæmorrhage from the mucous membrane of the body of the uterus, which normally recurs at regular intervals of, approximately, one month, and continues throughout the whole period of sexual activity in women, except during pregnancy and lactation. In a menstrual period there are three phenomena intimately connected together. First, active hyperæmia of the uterus and ovaries, with engorgement of the erectile tissue surrounding those organs; second, rupture of one or more Graafian follicles, with escape of the contained ovules; third, disintegration of the surface of the mucous membrane lining the body of the uterus, in degree sufficient to cause rupture of the vessels and effusion of the menstrual blood. With the latter is associated an increased secretion from the cervix and vagina.

There are several points in the physiology of menstruation, and in the relation between its several elements, as to which exact data are as yet wanting. Since the connection of menstruation with ovulation, first suggested by Power in 1821, was established by the researches of Négrier, Bischoff, Coste, Pouchet, Raciborski, and others, it has generally been believed that the mucous membrane becomes tumefied during the period, that the height of hyperæmia is coincident with the flow of menstrual blood, and that the follicle is ruptured at the same time or shortly after. It has also been thought that conception is most frequent shortly after the end of a period.

Recent researches, however, especially those of Kundrat, Engelmann, Sir John Williams, and Leopold, while differing in important points, have agreed in showing that the mucous membrane attains its greatest thickness and development, and that hyperæmia is usually at its height, immediately before the commencement of a period. Anatomical evidence has also been adduced to show that the follicle is commonly ruptured before the onset of a period, though there are also cases recorded in which it was found not yet ruptured, but apparently on the point of rupture, during or immediately after menstruation. The view thus suggested by some modern observers—which is the same as that first supported by Pouchet and Tyler Smith—is that in the inter-menstrual epoch there is a growth of the uterine mucous membrane, to render it a fit receptacle for the ovum, and that the exfoliation of mucous membrane and discharge of blood constitute already a retrogressive change, analogous to the separation of the decidua in parturition, and denoting that the impregnation of that particular ovum has not taken place. From this view would follow a conclusion contrary to that hitherto general, namely, that the fertilized ovum commonly belongs, not to the last menstrual period which occurred, but to the succeeding period which failed to appear.

At present the probability appears to be against this view. I have several times performed abdominal section on the first day of menstruation, and have found no recently ruptured Graafian follicle, but one apparently ready to rupture. A consideration of the analogy to the period of heat in animals leads to the same conclusion. In them the period of heat coincides with the development of the ovules which are ready to be fertilized, and its onset does not mean that their fertilization has failed. It is probable that normal menstruation in women is analogous, not to the whole period of heat in animals, but to its initial stage; the time most suitable for fertilization being just after the end of the period.

Another explanation, equally consistent with the facts which have been proved as to the development of the mucous membrane before menstruation, is that the exfoliation of the surface of the mucous membrane is not an indication that any ovum has failed to be fertilized, but is exactly the condition required to facilitate the attachment of the ovum to the surface denuded of epithelium. According to this view, whatever be the date of the fertilizing coitus, or the rupture of the Graafian follicle, the implantation of the ovum on the mucous membrane commonly takes place shortly after the end of a period.

Recent evidence has also compelled us to regard the association of ovulation with menstruation as by no means an invariable, although probably a general rule. In women whose ovaries are not developed, and in those who have been spayed before puberty, menstruation never appears. Thus it is proved that some influence from the ovaries, which is now generally regarded as being an internal secretion, is necessary for the establishment of that function. A considerable number of cases has been recorded, however, in which, after removal of both ovaries, menstruation has continued more or less regularly for years. Anatomical evidence has also been found, on the one hand, of recent ovulation during a period of amenorrhœa, or even where no menstruation had ever taken place, and, on the other hand, of the absence of any sign of recent ovulation in women who have died, or have had their ovaries removed, during or immediately after menstruation. In rare cases, also, pregnancy has occurred in women who had never menstruated, though long past the age of puberty, or who had passed the menopause for years.

Nevertheless, it remains true that the association of ovulation and menstruation is the general rule. After removal of both ovaries, menstruation does usually cease from the time of the operation. Some of the apparent exceptions may be explained on the ground that the ovaries were removed piecemeal, and that some small portion of their tissue may have been left, and perhaps may have maintained its vitality even on the distal side of the ligature. Thus, in several cases, not only menstruation, but pregnancy has occurred after the supposed complete removal of both ovaries. Again, amenorrhœa is a common result of cystic degeneration of both ovaries.

I have had, however, in several cases the opportunity of verifying the entire absence of Graafian follicles or ovarian tissue in women who have had their ovaries removed, mostly on account of fibroid tumours, and who have continued to menstruate notwithstanding. In these cases, such a strong habit of menstruation appears to have become implanted in the nerve centres that it continues for a less or greater number of years, notwithstanding the removal of the ovarian stimulus. In one such case, although regular menstruation continued for years, the menopause came on about the age of thirty-five, with symptoms of unusual severity and duration.

Hence the probable conclusion is that the immediate source of the menstrual nisus, and of its periodical recurrence, lies rather in the nervous centres than in the ovaries, though the stimulus of the ovaries is necessary for its first establishment, and in most cases for its continuance. The final development and rupture of the Graafian follicle would then be rather the effect than the cause of the hyperæmia, and the exact period of its rupture might probably vary according to the stage which it had reached when the menstrual nisus commenced. It is also probable that Graafian follicles may occasionally be ruptured in the inter-menstrual intervals, especially under the influence of the hyperæmia induced by coitus; and it is certain that the menstrual period may pass without the rupture of any follicle, if there happen to be none sufficiently near to maturity.

These facts have led some to conclude, that, as the limitation of sexual excitement to a particular epoch, usual in the lower animals, has been lost in the human subject, so ovulation is no longer exclusively associated with the same epoch, but occurs indiscriminately at any time. The preponderance of evidence however, tends to show that the association of ovulation and menstruation is the usual, though not the invariable, rule.

The view that the immediate cause of the menstrual nisus lies in the nervous system appears to be supported by the fact that there are not merely local changes in menstruation, but a monthly cycle affecting the whole organism. Sphygmographic observations have shown that arterial tension is above the average for some time before the period, and becomes lowered during the period. Jacobi and Stevenson have shown that the curve of temperature rises about half a degree above the mean for about a fortnight before the period, falling to a similar extent below it during and after the period, and also that a curve representing the excretion of urea follows a similar course.

It is not certain how the monthly periodicity first came to be implanted in the race. The close correspondence of the average period with the lunar month suggests some connection between the two. It cannot have anything to do with tides, as suggested by Darwin, since spring tides and neap tides recur twice in the month. It has been stated that a larger number of women menstruate about the time of full moon than at any other time. This recalls the fact that some animals, such as cats, appear to find a full moon convenient for amorous wanderings.

Source of the Menstrual Blood.—That the effusion of blood does not depend upon hyperæmia solely, is shown by the fact that, when the uterine mucous membrane receives the stimulus in nutrition due to the implantation of a fecundated ovum, no hæmorrhage occurs, although the hyperæmia increases to a higher point than that of menstruation. The first step leading to rupture of the vessels is therefore a disintegration of the mucous membrane, or, at any rate, a weakening of the vessel walls, sufficient to cause them to give way; and a fatty degeneration of the mucous membrane, preceding the commencement of hæmorrhage, has been described by Sir John Williams. On careful microscopic examination of the menstrual blood, groups of cells belonging to the uterine mucous membrane may frequently be found, especially during the first two days of the period; and not infrequently minute shreds of membrane, showing the apertures of the uterine glands, generally denuded of their epithelial lining, are also seen. The completeness of the disintegration appears to vary in different persons, but exfoliation in larger pieces is a morbid condition, which will be noticed under the head of membranous dysmenorrhœa.

If the uterus of women who have died within about ten days after the end of the last period be examined, the mucous membrane is found to be generally not more than $\frac{1}{20}$-in. to $\frac{1}{10}$-in. in thickness, and it shows no very sharp line of demarcation from the muscular wall beneath, the extremities of the glands dipping into the muscular layer. If death takes place during a period of amenorrhœa, the condition is very similar. If, however, a woman who menstruates normally has died very shortly before the expected onset of a period, the thickness of the mucous membrane is generally much greater, being often as much as $\frac{1}{6}$-in. at its thickest part. The cells of the interglandular layer appear to be less closely packed, but retain their small size, differing entirely in this respect from the cells of the decidua in pregnancy. The more developed mucous membrane is usually sharply marked off, by a straight border, from the muscular walls of the uterus. This difference in the thickness of the uterine mucous membrane before menstruation appears to be greater than œdematous swelling would account for, and seems to indicate that an appreciable amount of the surface is thrown off at each menstrual period, and replaced by growth during the inter-menstrual intervals.

It was maintained by Sir John Williams that the whole of what is generally described as mucous membrane is cast off at each period, leaving only the blind extremities of the glands, in connection with the muscular wall. Tyler Smith previously held the same view. Improved methods of microscopic preparation and section-cutting have shown that this is not the case; and it is now generally held that only the superficial part of the mucous membrane is exfoliated. The frequency with which shreds of membrane may be found on careful examination of the menstrual discharge, appears to show that the exfoliation which occurs in membranous dysmenorrhœa is not an occurrence absolutely pathological and out of relation to the normal process, but is rather a morbid exaggeration of what occurs in some degree naturally. Wyder records two cases of death from accident on the fourth and eighth days respectively from the commencement of menstruation. He finds a notable loss of thickness of the mucous membrane during menstruation, but no disintegration of its whole thickness. Leopold, Engelmann, and Spiegelberg hold that only the most superficial layer is thrown off. I have snipped out a small portion of the surface of an inverted uterus at the end of menstruation after six days' duration, and have found a thickness of mucous membrane as much as $\frac{1}{10}$-in. existing. In a case of sudden death of a young woman by drowning, ten days from the beginning and seven days from the end of a period, I have found a fully-developed mucous membrane $\frac{1}{6}$-in. thick, a thickness which seems to be too great to be consistent with the whole thickness of the mucous membrane having been thrown off in menstrua-

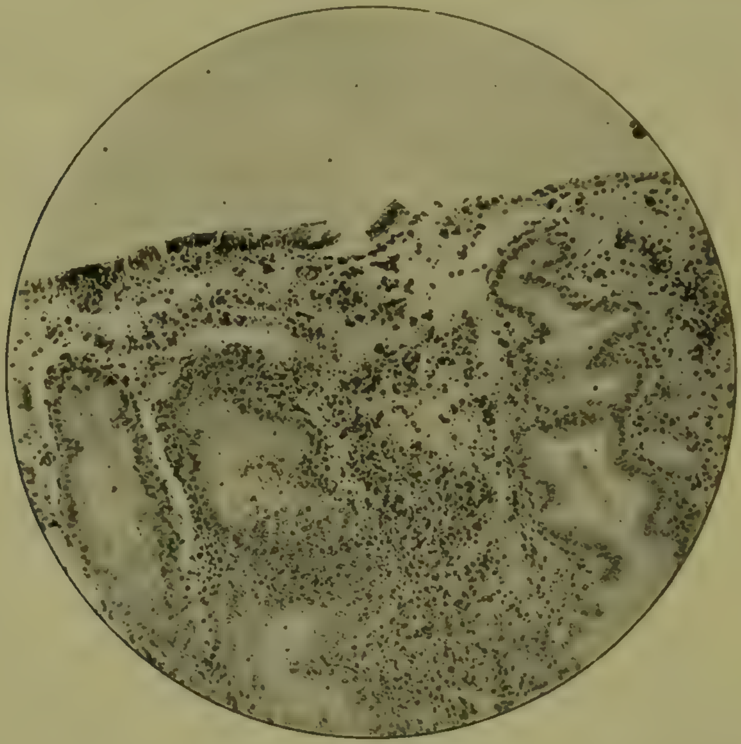

Fig 82.—Mucous Membrane of Uterus removed by Hysterectomy on first day of Menstruation.

tion. Probably the proportion of mucous membrane exfoliated varies in different women, even apart from the occurrence of any obvious membranous dysmenorrhœa.

In Fig. 82 is shown a section of the mucous membrane of a uterus which I removed by hysterectomy a few hours after the commencement of menstruation. There was a small sub-peritoneal fibroid on the uterine wall, associated with some menorrhagia, but the mucous membrane was smooth and not apparently diseased. The cells of the inter-glandular stroma are separated by effusion containing many blood-corpuscles, and forming some irregular lacunæ. The lumen of the superficial glands is wider in proportion than usual. The epithelium of the glands is indistinct, and in places irregular and apparently disintegrating. The superficial epithelium is partially detached. The section should be compared with that of normal mucous membrane shortly before menstruation shown in Fig. 9, p. 14, allowance being made for the fact that the former section is more highly magnified.

The doctrine that menstruation is associated with exfoliation of the mucous membrane is supported by the observations of Heape on monkeys in India, including the higher anthropoid apes. *

Heape finds that monkeys in India menstruate regularly every month. During the period of growth the mucosa as a whole is increased in thickness by swelling of the inter-glandular stroma, and its nuclei become more fusiform. The glands are not much altered, except that their lumen becomes wider.

At the onset of menstruation, there is degeneration of the superficial layers of the mucosa. In this layer congested capillaries break down with extravasation, and red and white cells are swept into the stroma. The extravasated blood collects in lacunæ in the stroma, and these lacunæ, extending and dissecting, lift the epithelium. All the epithelium, portions of glands, and sometimes whole glands, are swept away. The inner surface of the uterus appears ragged, with masses of blood here and there, but the deep layers of the stroma are wholly intact.

In regeneration, the epithelium is formed anew by extension from the torn edges, or by transformation of the stroma cells.

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* Heape, "Menstruation in Monkeys," Phil. Trans., 1894, p. 411. "Menstruation and Ovulation of Monkeys and the Human Female." Obstet. Trans. 1898, p. 161.

New capillaries are formed and new blood-vessels; and new glands by the ingrowth of epithelium. Extravasated blood is absorbed.

In Macacus Rhesus and Semnopithecus, Heape found that the breeding season is strictly limited, and that no recently discharged follicles are found at other times; but that menstruation continues regularly all the year round. This may be compared with the fact that it is by no means uncommon in women, when the ovaries are removed by operation, to find no fresh corpus luteum of menstruation, although menstruation has occurred recently. On the other hand, a fresh corpus luteum of menstruation has occasionally been found during a period of amenorrhœa, just as pregnancy occasionally occurs at such times.

The Fallopian tubes are not considered normally to be concerned in the production of the menstrual flow. But in deaths from violence during menstruation, the Fallopian tubes have been found filled with fluid containing blood-corpuscles and epithelial cells.

The view that permanent communications exist between the blood-vessels and the uterine glands, and that these are the source of the exudation of menstrual blood, may be regarded as now exploded. The mucous membrane of the cervix normally takes no part in the outpouring of blood, and its surface remains intact. The coagulation of menstrual blood is usually prevented by its mixture with mucus. Thus retained menstrual fluid does not clot. If the quantity of blood is excessive in proportion, or if it is poured out irregularly, clots are formed, sometimes in the uterus, sometimes only in the vagina. The quantity of blood normally lost is estimated at from three to seven ounces. The amount of loss depends in great measure upon the degree of active hyperæmia, as is shown by its increase from the effects of exercise, or in consequence of coitus. The natural duration of the flow is from three to five days, but in some women it lasts habitually for seven or eight. The period of recurrence, in women who are perfectly regular, usually varies from twenty-seven to thirty days.

Period of Possible Conception.—There are two considerations which render it very difficult to draw any positive conclusions as to the stage of the menstrual cycle at which it is possible, or usual, for conception to occur: first, that the life of spermatozoa within the uterus may be prolonged for certainly as much as eight days, and possibly for longer; and, secondly, that we have no evidence, in the human subject, as to the time occupied by the ovum in descending the Fallopian tube, or during which it may retain its vitality. There is no doubt that fruitful intercourse may occur at any part of the menstrual cycle, and that any method for preventing pregnancy by abstinence during any special period is unreliable. That abstinence shortly after the period has no such effect appears to be shown by the case of the Jews, who are, if anything, more fertile than other races. Strict observers of the Jewish law are said to practise abstinence during five days for the period, and seven days for purification afterwards, reckoning from the end of the five days, or from the last appearance of blood if the appearance lasted longer than five days—an interval which amounts to at least twelve days in all.* It is, however, one thing to lay down such a regulation in the priestly code, and another to secure its general observance, when that observance implies the practice of abstinence at the period when sexual feeling is naturally most acute. I have not yet met with Jewesses who profess to observe the latter part of the regulation.

The converse fact that a single fruitful coitus may occur between four and ten days after the commencement of the flow is proved by cases recorded by Marion Sims, who considered the latter part of this period as the preferable time in order to ensure pregnancy. It can scarcely be doubted that menstruation is really analogous, in some measure, to the æstus or rut of animals; although there is the important contrast that, in animals, coitus takes place only at the time of æstus; but in the human subject, usually at any other time except that of menstruation. The latter circumstance, however, is rather the result of civilization, and of a feeling of delicacy, for there is no doubt that an increase of sexual feeling does normally take place at the menstrual period as at that of æstus. Hence the common opinion that intercourse soon after menstruation is more likely to prove fruitful is probably correct. It agrees with a comparison of the rule which experience has shown to be most useful for calculating the date of delivery—namely, that the most probable date is about two hundred and seventy-eight days from the end of the last period, with the fact that the average duration of pregnancy from a single known coitus has been calculated at two hundred and seventy-five days. Within what limits of time the uterine mucous membrane is capable of receiving an ovum remains as yet uncertain.

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* *See* Leviticus xv. 19 to end.

Commencement and Cessation of Menstruation. — The first appearance of menstruation usually coincides with the age of puberty, and the development of the breasts, the pelvis, and the hair on the pubes, as well as the mental changes which occur at the same time. The most frequent age is, in temperate climates, the fourteenth or fifteenth, or, somewhat less commonly, the sixteenth year; but variations between the tenth and twenty-first year are not very rare. The influence of climate is considerable, and in hot countries menstruation commences, on the average, about two years earlier, while it is, at the same time, more profuse. In Arctic climes, on the other hand, its appearance is delayed to about an equal extent, and the quantity of blood lost is very small. Cases of precocious menstruation occasionally occur in childhood, and even infancy, and are then associated with premature development of breasts and pelvis, of sexual feelings, and probably with premature ovulation. In such a case, pregnancy has occurred at the age of eight years.

Even a moderate precocity in menstruation, as at the age of ten or eleven, is apt to be followed by indications of undue ovarian activity, and by profuse and painful menstruation and leucorrhœa. It is possible that premature sexual stimulation may sometimes be concerned in the causation of it.

The time of cessation of menstruation (climacteric period, menopause, or change of life) is, on the average, about the age of forty-eight. Women who menstruate early do not generally reach the menopause early, but the contrary, unless some diseased condition of ovaries or uterus has supervened; and, when menstruation is established late, the same ovarian inactivity often leads to an early cessation. In very rare cases true menstruation may continue, and pregnancy be possible, as late as the age of sixty.

Symptoms and Concomitants of Menstruation.—In women of robust health no premonitory signs are noticed, but in those of more impressible nervous system, for some days before the period is due, the breasts often become firm, or even painfully hard, and may be the seat of neuralgic pain, a condition which generally disappears within a day or two after the commencement of the flow. At the same time there is an increased irritability of nerve centres, which, in women subject to hysteria, epilepsy, or migraine, is shown by the greater frequency of attacks at this period. If congestion of uterus or ovaries is present, pelvic pain precedes menstruation by some days. In cases of hernia of the ovaries, these organs have been found to become swollen and tender a little before menstruation, and continue so during the period. Vaginal touch during a menstrual period shows the uterus as well as the vagina to be turgid and soft. The soft condition of the uterus, however, is alternated with contraction, especially if any obstacle to the flow exists, and, if death occurs during a period, the muscular wall of the uterus is often found pale, from expulsion of the blood, while the mucous membrane, ovaries, and surrounding parts are highly congested.

The cervix uteri, vagina, and vulva participate in the engorgement, and increased secretion from them precedes, accompanies, and follows the flow of blood. There is often a tendency to constipation shortly before the period is due, just as there is in early pregnancy, even before the uterus has enlarged sufficiently to produce any effect by pressure, and this constipation may be succeeded by relaxation of the bowels after the flow has commenced. Even in health, some degree of fulness, and of general lassitude, is usually felt just before, and for the first two or three days of the period—a condition expressed by the saying of women, that they are "unwell."

CHAPTER V.

MALFORMATIONS OF THE UTERUS AND VAGINA.

The Fallopian tubes, with the uterus and vagina, are developed from two distinct tubes, called Müller's ducts, which begin to coalesce about the eighth week of fœtal life throughout that portion which forms the uterus and vagina, the point where junction should begin being marked by the insertion of the round ligaments. By the end of the twelfth week, the union is completed by the disappearance of the septum. By the end of the twentieth week, the uterus appears single and no longer bicornuate, and the arbor vitæ of the cervix is formed. The graver congenital deformities of these organs depend upon a complete or partial failure either in the development of one or both of these ducts, or in their junction, and it will therefore be convenient to consider such deformities, both of uterus and vagina, in conjunction.

Absence of the Uterus.—Complete absence of the uterus is very rare, except in the case of some fœtal monstrosities. In an adult its existence can only be proved by dissection, since a rudimentary uterus may be so thin or small as to be indistinguishable on examination during life, even under an anæsthetic. If the uterus is absent, the Fallopian tubes are generally impervious; the ovaries may be present, but are rarely fully developed, though ovulation may take place. The vagina is usually absent. If the tubes are absent as well as the uterus, the peritoneum is reflected from the bladder to the rectum. If they are present it forms a mesosalpinx for each. The peritoneal fold may be cleft at the centre to the bottom of the pouch of Douglas, or may extend across the pelvis, the uterus being represented at the centre by a fibrous band.

Rudimentary Development of the Uterus.—Under this term are included those cases in which the uterus is represented by a small mass of muscular or fibro-muscular tissue, which may be solid or contain one or two cavities. The commonest form is the *uterus bipartitus*, in which there is a single solid mass representing the cervix, and separate horns containing small cavities. This may be inserted at the top of a vaginal *cul-de-sac*, or the vagina may be absent. In other cases the uterus is represented by a single solid cord, or by two cords entirely separated by a cleft in the peritoneal fold, constituting a rudimentary form of the *uterus didelphys*. Imperfect development of the Fallopian tubes and ovaries is often associated. The vulva is generally normally developed, but the pubic hair may be scanty, and the breasts small.

Both in absence and rudimentary development of the uterus there is permanent amenorrhœa. A menstrual molimen may occur, if the ovaries are developed, and in some cases has led to so much discomfort that the ovaries have been removed on account of it.

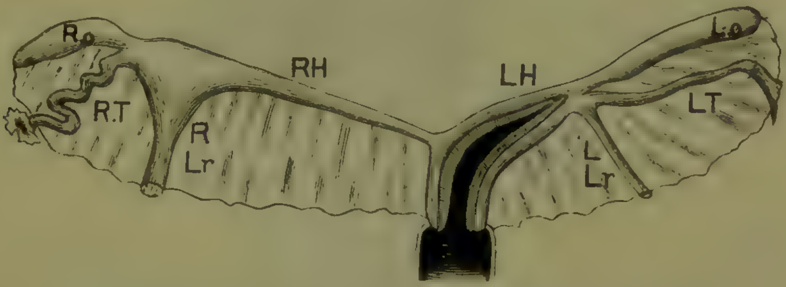

Fig. 83.—Uterus Unicornis Sinister, seen from the front.

R H, right horn, rudimentary ; L H, left horn ; R T, right Fallopian tube ; L T, left Fallopian tube ; R O, right ovary ; L O, left ovary ; R LR, right round ligament ; L LR, left round ligament.

A diagnosis that the uterus is either absent or rudimentary may be made by finding that, if the vagina is present, no normal uterus can be felt bimanually. On examination with a finger in the rectum and a sound in the bladder, no mass of any size can be felt intervening. The ovaries may or may not be tangible. Sometimes the broad ligaments can be felt from the rectum forming a loop across the pelvis, with perhaps the rudimentary uterus in the centre.

No treatment of any kind is available whether the uterus is absent or rudimentary.

ABSENCE OR DEFICIENCY OF ONE HALF OF THE UTERUS.—The duct of Müller, on one side, may be formed normally, while that on the other is absent or imperfectly developed, and fails to coalesce fully with its fellow. This condition constitutes the *uterus unicornis* (Fig. 83). The uterus is curved to one side and terminates in a point, from which the round ligament and other appendages take their origin. If the one horn is entirely absent, the tube and ovary of the corresponding side are commonly absent also; but have been found apparently unconnected with the uterus, lying in the lumbar region. The rudimentary cornu, if present, is commonly attached about the position of the internal os, or rather lower, and may be pervious or not. Thus the whole or a part of the cervix represents both Müllerian ducts, and is, therefore, more bulky than usual in comparison with the fundus. The attachment of the round ligament settles where the rudimentary horn ends and the tube begins (Fig. 83, p. 117). Menstruation is usually normal. Pregnancy may occur in the developed horn, and proceed naturally. It may also take place in the rudimentary horn, and is then likely to lead to rupture, commonly before the end of the fourth month, and so endanger the patient's life. The fœtus may, however, be developed up to the full term without rupture.

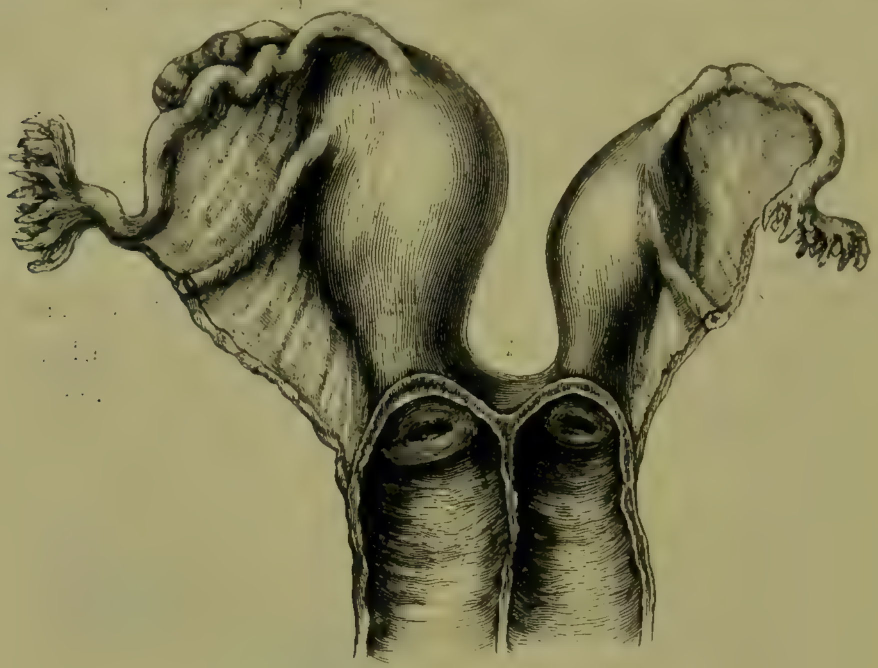

Fig. 84.—Uterus Didelphys.

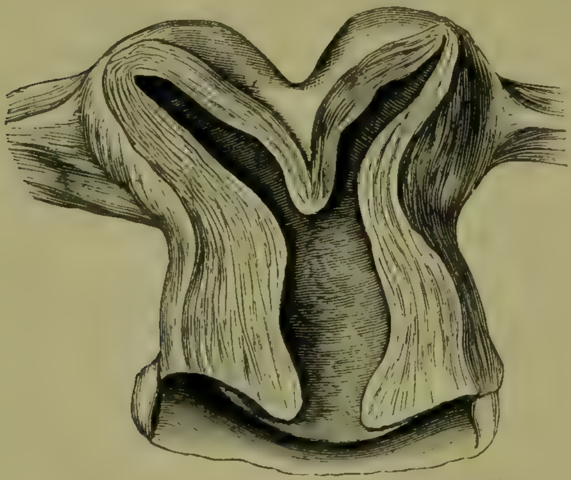

Fig. 85.—Uterus Bicornis Unicollis.

Want of Union of the Lateral Halves of the Uterus or Vagina.—The rarest form of this malformation is that in which the two halves of the uterus remain completely separate—*uterus didelphys* (Fig. 84). They are divided by a cleft in the mesometrium reaching nearly to the level of the vagina. The majority of cases recorded have been found in stillborn children where other deformities existed. The vaginæ are separate, and one vagina may be imperforate toward the vulva. Each uterus has its own Fallopian tube and ovary, the top of the uterus being marked by the insertion of the round ligament. Often the two halves are unequally developed. Pregnancy may occur in one half, or in both halves simultaneously.

A much commoner condition is that in which the lateral halves of the uterus unite partially, and form the uterus bicornis, corresponding to the normal uterus in many of the lower animals. The fundus uteri is then outwardly divided into two horns. There are three varieties of this—*uterus bicornis unicollis* (Fig. 85), in which the fundus is divided internally, the cervix single; *uterus bicornis bicollis*, in which the septum extends through cervix as well as body, and the vagina is often also double; and *uterus arcuatus*, in which there is merely a vertical depression in the centre of the fundus.

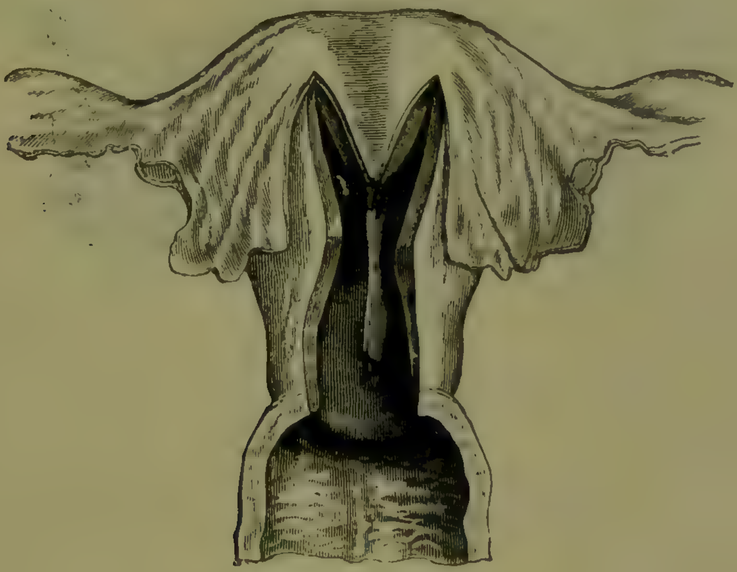

Fig. 86.—Uterus Subseptus.

If the uterus is single externally, it is called *uterus septus*, or *bilocularis* if it is completely divided by an internal septum; *uterus subseptus* or *semipartitus* (Fig. 86), if the division is incomplete either at the top or bottom. If the division extends to the bottom, the vagina may be double or partially septate (Fig. 87).

Finally, with a normal uterus, there may be a septum in the lower portion only of the vagina. The septum is then likely to form an obstruction to labour, and to be torn through in delivery.

In all forms of double uterus, both sides commonly menstruate together, but the bleeding may take place from one alone. Pregnancy may occur in one or both halves, and the double character of the uterus appears to have been the main element of the case in many of the recorded cases of superfœtation, in which a second ovum is fertilized at an interval of one or more months after the first. When pregnancy occurs in one half, a decidua is formed in the second half also, and is generally expelled at some interval after delivery. This occurrence may be the first indication of the double character of the fundus uteri, when cervix and vagina are single. After pregnancy in one horn of a uterus bicornis unicollis, the placenta may be incarcerated by the horn contracting around it, and is then more difficult than usual to extract, or even find. In a similar uterus, I have known the head of the child to get into the non-pregnant horn, which became turned downward into the pelvis, the cervix being out of reach above the pubes. Cæsarian section was required for delivery. A double uterus, especially *uterus septus*, appears somewhat to promote the occurrence of miscarriage.

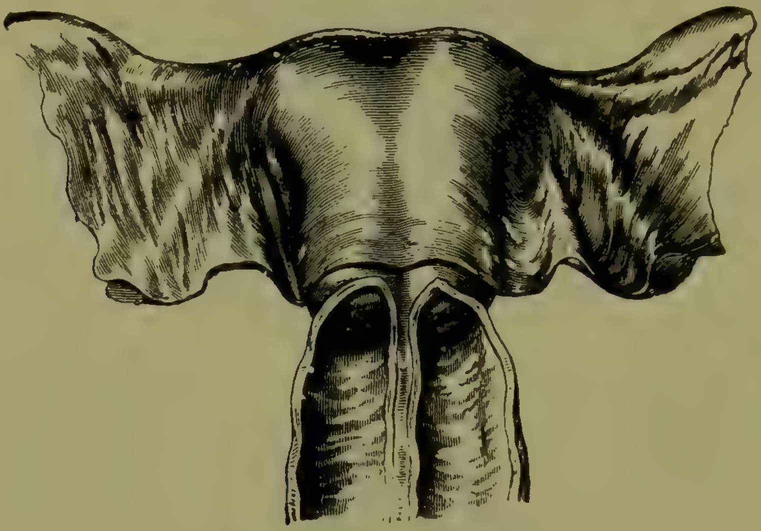

Fig. 87.—Uterus Septus with Septate Vagina.

When the vagina is double, either side may be capacious enough for coitus, or one side only, or the septum may cause difficulty. But single women, and sometimes even married women, may remain in ignorance that they have any abnormality.

If one side of the genital canal is imperforate toward the vulva, the menstrual fluid is retained on that side when puberty is reached, and hæmatocolpos or hæmatometra, or both, may be formed. If there is a small communication only at a high level, as within the uterine cavity, there is partial retention, microbes gain access, and suppuration occurs with a foul-smelling discharge.

Diagnosis.—A uterus subseptus is commonly discovered only accidentally, when some occasion has arisen to dilate the cervix, or when the hand is introduced into the uterus after delivery. This, or a uterus bicornis, may be revealed by the passage of a decidua during the puerperal period. A uterus bicornis may be distinguished by the shape of the fundus as examined bimanually. In the uterus didelphys, the sound can generally be passed into a uterus from each half of the double vagina; and each half of the uterus can be felt bimanually, movable separately from the other.

The greatest difficulty of diagnosis arises when one half of the uterus or vagina is imperforate. This will attract attention only when menstrual fluid is retained. When menstrual pain commences with puberty, and a lump is discovered at one side of the uterus, closely connected with it, suspicion should be aroused of hæmatometra in the imperforate half of a double uterus. In the case of a uterus didelphys, with atresia, the lump will be movable quite separately from the other uterus.

In the case of hæmatocolpos in the imperforate half of the vagina, the diagnosis is sometimes rendered more difficult by the fact that the imperforate half is not quite lateral, but rotated, so that it seems to lie between the vagina and bladder. The true nature of the distended canal is then only positively ascertained by incision. Whenever a purulent offensive discharge comes away through the vulva in a virgin, especially if it has commenced soon after the age of puberty, careful search should be made for some congenital abnormality.

Treatment.—If a double vagina gives any inconvenience, the septum can be easily excised. In cases in which the septum does not extend to the top of the vagina, it should always be excised, because then it is likely to form an obstacle to delivery, the centre of the fœtal head impinging upon it. The septum of a double uterus may generally be left alone, unless either repeated miscarriage or irregular hæmorrhage occurs. In these cases it may be advisable to divide it, after previous dilatation of the cervix. In the case of atresia of one half of the vagina, the septum should be excised. When the atresia is at the lower part of the uterus, it is generally sufficient to open the cavity and keep the canal patent.

The uterus is often imperfectly developed, and then assumes one of two forms—(1) the *infantile uterus* (Fig. 88), in which the cervix is naturally formed, but the body remains of the same relative size during infancy, constituting only one-fourth or one-third of the whole length, and having relatively thin walls; (2) the *generally ill-developed uterus*, sometimes called the *uterus pubescens*, in which the normal relative proportion is maintained, but the whole organ is atrophic. The former of these malformations originates during the later months of fœtal life, or in infancy; the latter during childhood. The latter condition is often associated with stenosis of the external os and anteflexion, and will be further discussed under those headings. When the uterus is infantile, menstruation is usually absent; when it is generally ill-developed, it is either absent or scanty. The infantile uterus may be diagnosed by bimanual examination, which reveals the small size of the body, while the sound passes only to a length of from 1¼ to 1¾ inches, and can be felt through the thin fundus with unusual distinctness. The generally ill-developed uterus is distinguished from the infantile by the small size of the vaginal portion.

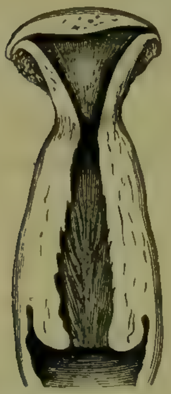

Fig. 88.—Infantile Uterus.

Treatment.—When the uterus is imperfectly developed, nutrition should be stimulated as much as possible by nourishing diet and the administration of iron, especially if there is any tendency to chlorosis. Of still greater importance is hygienic treatment by abundance of fresh air and a suitable amount of exercise, with the avoidance of too prolonged study or sedentary occupations, especially about the age of puberty. The question of employing any local stimulus will be discussed under the head of amenorrhœa.

ATRESIA OF THE UTERUS, VAGINA, OR VULVA.

All occlusions of the genital canal, at whatever point situated, and whether congenital or acquired, have a common effect in preventing the exit of the menstrual blood, when the body of the uterus itself is developed, and so lead to a similar group of symptoms. It is, therefore, convenient to consider the several varieties of atresia together.

CONGENITAL UTERINE ATRESIA, apart from atresia of the vagina, is very rare, and may affect the external os, or, still more rarely, the whole cervix. Atresia may exist in one half of a double uterus. Diagnosis is then more difficult than usual, for there is generally menstruation from the patent side of the uterus, while, on the other side, the menstrual fluid is retained, and the fact that the uterus is double may easily escape detection.

CONGENITAL VAGINAL ATRESIA is much commoner, and may consist either in complete or partial absence of the vagina, in an imperforate condition of the hymen, or in closure of the vagina by a transverse septum, which is generally situated immediately behind the hymen, and may easily be mistaken for *atresia hymenalis*. Even when the septum is thin, it appears to be due, in the majority of cases, not to an imperforate hymen, but to a failure of the vagina, developed from above, to unite with the genital cleft by absorption of the intervening tissue. In many cases in which there is apparently a total absence of the vagina, the lower part of the cavity distended by menstrual blood is irregular in shape, and appears to correspond partly to the cervix and partly to a portion of the summit of the vagina. No distinct external os is formed, and the cavity has thick muscular walls, like those of the uterus rather than those of the vagina.

ACQUIRED UTERINE ATRESIA usually affects some portion of the cervical canal. It may result from the application of the actual cautery, potassa fusa, strong acids, or even the solid nitrate of silver, from supra-vaginal amputation of the cervix for cancer, from amputation of the vaginal cervix, especially when performed by the galvanic écraseur, from the presence of growths in the cervix, whether fibroid or cancer, or from any injury to the cervix. It may also be the effect of cervical catarrh, through adhesion of the granulations formed on opposite sides of the canal, especially when the passage is no longer kept patent by the flow of menstrual blood. It is not uncommon, therefore, in old women, especially when prolapse of the uterus exists. Even before the menopause, atresia may result from abrasion close to the os, produced by friction upon a prolapsed cervix.

ACQUIRED VAGINAL ATRESIA is usually the result of sloughing of the vaginal walls after protracted labour, or, in rare cases, after abortion. It may also be the effect of injuries, of inflammation or sloughing of the vagina after fevers, or the febrile diseases of childhood, or of venereal ulceration. In some cases it is combined with vesical or rectal fistula. The labia minora are not uncommonly adherent in little girls, but the vagina is not completely closed thereby, though the union may extend further forward than the orifice of the urethra. A small aperture remains below the clitoris through which the urine escapes. The adhesion is easily separated without any need for incision. This condition is not a fault of development, but may arise either during fœtal life or after birth.

Results and Symptoms.—Congenital atresia usually attracts no attention during childhood, but occasionally, even in early life, an accumulation of secretion has taken place behind an occluding septum. Even in infancy a collection of muco-purulent fluid has occurred to such an extent as to cause by pressure dilatation of the ureters, and disorganisation of the kidneys. As soon as menstruation commences, the menstrual blood collects behind the occlusion, and begins to distend the genital canal from below upwards; first the vagina, if that is present, then the cervix, then the body of the uterus.

The commonest condition is that of hæmatocolpos only, the whole uterus being undistended at the top of the distended vagina. The next stage is usually that of distension of the cervix, and the external os may become flush with the distended vagina, before distension of the body, whose muscular walls are stronger, commences. The condition varies, however, in different cases. In a specimen in the Radcliffe Museum at Oxford, there is a marked constriction at the external os; the vagina, the whole uterus, and the internal os being completely expanded, and the Fallopian tubes also dilated. If the atresia is about the situation of the external os, the whole uterus becomes dilated into a single cavity from the first, and the internal os is obliterated by distension.

In some cases the Fallopian tubes are found also distended, the ostia closed, with frequently some peritoneal adhesions. This rarely happens when the septum is low down in the vagina; but chiefly in cases in which the atresia is a broad one, and extends to a high level. It appears to be commoner in acquired than in congenital atresia. It is then easy to understand how the inflammation originated, which must have occurred to close the tubes, and prevent the menstrual fluid oozing out into the peritoneal cavity. The inflammation which led to the adhesion of the vagina and cervix would probably affect also the endometrium, extend to the tubes, and thence to the peritoneum, causing adhesive inflammation about the fimbriæ of the tubes. A morbid sanguineous secretion then takes place from the lining of the tubes, and distends them, since it cannot escape either through the ostia or through the uterus. In some instances it is evident that the fluid distending the tubes is derived from the tubes themselves, the uterine end of the tubes remaining undilated.

If the tubes are found dilated in congenital cases, the explanation must be that, when a certain degree of tension of the retained fluid is reached, the tubes are expanded enough to allow a little of it to ooze into the peritoneal cavity. This sets up sufficient inflammation to cause adhesion of the fimbriæ to surrounding parts, or inflammatory closure of them, and then progressive distension of the tubes occurs.

The muscular walls of the uterus have generally been found thin, not hypertrophied as in pregnancy. During the intermenstrual intervals, a considerable portion of the fluid portion of the blood is reabsorbed, and thus the swelling formed diminishes during such intervals. The retained fluid acquires a thick, viscid, treacly consistence, and dark, tarry appearance, containing a large proportion of mucus. On this account it never clots, nor does it decompose so long as there is no opening, and it is not infected by putrefactive germs from the intestinal canal. If, however, it is once infected, it becomes an excellent culture medium for pathogenic germs. The quantity of fluid retained has exceeded 50 ounces.

In cases not relieved by operation, the septum, if a thin one, may give way, generally from some sudden exertion. A spontaneous cure in this way is possible. But more often the opening is a small one, the fluid escapes incompletely; germs gain access, septic endometritis occurs, and is apt to lead to septicæmia or septic peritonitis. If the tubes are distended, a tube may burst, and set up fatal peritonitis. When the atresia is a broad one, rupture has occurred into the rectum, bladder, cellular tissue, or through the perineum.

After the menopause, an acquired atresia, especially one affecting the cervical canal, may result in distension of the cavity of the uterus by mucous fluid (*hydrometra*). If the interior of the uterus becomes infected before it is shut off by gradual contraction of the canal, the contents may be purulent instead of mucous (*pyometra*), and often offensive. This is especially liable to occur if the cervical canal is occluded by the growth of cancer of the cervix. But it may also happen if the canal gradually contracts and closes after any operation, especially after supra-vaginal amputation of the cervix for cancer.

Diagnosis.—Attention is generally attracted by the occurrence of pain about the time of puberty at monthly intervals, but without any menstrual flow. The pain may be prolonged longer than a normal period, but subsides in the intervals. As time goes on, it becomes more severe. After a time a swelling appears above the pubes, and gradually increases. The feel of it is quite characteristic, if a small hard body, the uterus, or fundus uteri, can be felt at the top of an elastic rounded swelling. On examination of the vulva, the atresia is readily discovered. If the septum is thin and low down, an elastic swelling bulges between the labia. Its protrusion is increased by a bearing-down effort or pressure on the hypogastrium, and it has generally a bluish or purplish appearance.

Distension of the Fallopian tubes is only likely to exist if the collection of fluid is very considerable, and the whole uterus distended. It may be diagnosed by feeling, on one or both sides of a central mass, a sausage- or retort-shaped swelling corresponding to the position of the tube.

If the collection of fluid is considerable, it may cause, by pressure, interference with the normal action of the bowels, or retention of urine.

If the uterus is imperfectly developed, and menstruation does not occur, vaginal atresia may be discovered in consequence of amenorrhœa persisting beyond the usual age of puberty; or from an obstacle being found to coitus. Sometimes attempts at coitus have resulted in wide dilatation of the urethra.

Treatment.—When the occlusion consists only of a thin septum, the operation for evacuation of the retained fluid is extremely easy, but in these, as well as in more difficult cases, there is a risk of septic inflammation following, unless the most careful antiseptic precautions are observed, and death has not infrequently followed, especially in the days before the introduction of modern antiseptic methods. The danger is in proportion to the degree of distension, and is especially great if the Fallopian tubes are involved; while, if the collection of fluid is limited to the vagina, it is comparatively slight. The chief danger is that of infection of some remaining fluid by sapric or septic microbes, or both, and consequent sapræmia or septicæmia, especially septic peritonitis. There is also some risk of some of the fluid escaping into the peritoneal cavity during, or after, the evacuation; but this scarcely exists in the more common cases in which neither the body of the uterus nor the Fallopian tubes are distended. If the tumour is very large, and the tubes distended, the ostium of a tube may be torn away from an adhesion as the tumour shrinks, and the end of the tube left patent. Or the tube might be ruptured by the separation of an adhesion at some other part of it. Again, spasmodic contraction of the uterus or tubes, or both, might occur, sufficient to break down the adhesion closing the ostium. and cause reflux of fluid into the peritoneal cavity. The fear of this, however, appears to have been exaggerated.

The time chosen for the operation should be the period of greatest quiescence, a few days after the cessation of the pain which indicates the menstrual period. In the operation the utmost care should be used, as for an abdominal section, in disinfecting hands and instruments, as well as the vulva and its neighbourhood. In the fear of setting up spasmodic contraction, it has often been recommended to draw off the fluid gradually at intervals with an aspirator, and to abstain from using antiseptic douches. It is much better, however, to make a free incision at once; for, if the outflow is free externally, a uterine contraction is scarcely likely to break down the adhesion closing the ostium of the tubes. Unless the tubes are distended, no reflux can take place, since the uterine contraction will close the uterine ends of the tubes the more firmly.

Sometimes the Paquelin cautery is used to make the incision, with the idea that the cauterized surface will be less absorbent, and less likely to adhere again and cause future stenosis. Unless, however, the occluding membrane is very thin, it is better to excise it freely, and unite the mucous membrane with sutures over the raw edges, after the fluid has been evacuated. Chromic catgut sutures may be used, and left to dissolve out, the ends being cut short.

The fluid should be allowed to flow spontaneously, without any pressure or handling of the abdomen or fundus uteri, for fear of separating adhesions, or exciting spasmodic contractions. As soon as it has flowed away as completely as it will, the cavity should be washed out thoroughly with an antiseptic, so as to cleanse its walls thoroughly from the tenacious fluid. Care must be taken that septic germs are not introduced with the douche. Chinosol, 1 in 500, or tinct. iodi ʒj. ad Oj., in sterilized water may be used; or, if there is no fear of distended tubes, perchloride or iodide of mercury, 1 in 4,000. The douche should be used with very gentle hydrostatic pressure, care being taken that there is free outflow. It may be repeated afterwards twice a day.

Some authorities recommend packing the cavity afterwards with iodoform gauze, but this is not necessary in ordinary cases of hæmatocolpos, or even hæmatometra. If, however, there has been evidence of distended tubes, which cannot be completely evacuated at once, it is advisable to use an antiseptic plug, since it is impossible to maintain a complete asepsis by antiseptic dressings at the vulva. Moist iodoform gauze, 10 per cent., is the best material for the plug, and, if used at all, it must be passed quite up to the top of the fundus, so as to fill the whole cavity. It should be changed at twenty-four hours' intervals. In the absence of a plug a pad of sublimate wool should be kept applied to the vulva by a T bandage, being removed for the evacuation of bladder or bowels. In case of any decomposition occurring in the discharge, or elevation of the patient's temperature, the irrigations should be used very frequently, and quinine should be given in full doses, or antistreptococcic serum injected, if there is reason to suppose that septic infection has taken place.

When the whole or a considerable part of the vagina is absent, it is preferable, if possible, to make the permanent passage in the natural situation, rather than through the rectum; and the making of an artificial vagina may be undertaken when any uterus can be detected, even though there is no collection of menstrual fluid. When, however, as is often the case, the septum is very thin between rectum and bladder, great care is required to avoid opening one of these cavities. The patient should be placed in the lithotomy position, and the knife or scissors used only to make a transverse incision through the mucous membrane just in front of the fourchette. The rest of the passage should be torn by the index-finger of the right hand, while the left index-finger is kept in the rectum, and a sound is held by an assistant in the bladder. The operator is thus guided by the sense of touch in making a passage equidistant from either cavity. If necessary, for enlargement of the canal, the finger may be removed from the rectum, and used to assist the other in the artificial passage, or a blunt instrument, such as the raspatory employed for scraping bones, may be used in conjunction with the finger. The uterus, when reached, may be pierced either by a trocar or knife, if there is no patent os externum. The artificial vagina should be made at first larger than required. A full-sized Sims' dilator of glass (*see* Chap. XV.) should be introduced at once, and must generally be worn continuously for a good many months to avoid the strong tendency to contraction which exists. This serves to check hæmorrhage in the first instance, and, under its unirritating pressure, an epithelium, like that of mucous membrane, may gradually spread over the artificial vagina. Eventually, it may be possible to substitute for the dilator a narrow Hodge's pessary. As a general rule, it is found that, if a cul-de-sac of fair diameter exists, representing the upper part of the vagina, it is possible to make a serviceable vagina, by keeping dilated the intermediate artificial canal between it and the vulva. If, however, there is no vagina at all, it is usually impossible to make a canal satisfactory for marital purposes, although one may be kept open sufficient for the discharge of menstrual fluid. The first chance of doing so is to transplant flaps of skin from the labia minora and perineum to form a lining for the new canal.

It is recommended by Walton,* instead of avoiding the opening of the peritoneal cavity, to dissect upward till the pouch of Douglas is opened, and explore through the opening the condition and position of the uterus and annexa. The construction of the artificial vagina is then proceeded with, and the opening in the peritoneum closed by catgut sutures.

Marriage, if not already contracted, should not be advised until the patency of the new vagina has been tested for a considerable period. Should the attempt to make an artificial vagina fail, an alternative, if menstrual fluid is poured out, is to endeavour to keep open a passage *per rectum;* and some operators have adopted this measure from choice in the first instance. There is, however, a risk of opening the peritoneal cavity from the rectum. If, therefore, the artificial vagina cannot be kept patent, and menstruation gives serious trouble, the best treatment is to remove the uterus by abdominal section. The treatment of acquired atresia is similar to that of congenital, but the risk of evacuating retained fluid appears, in this instance, to be considerably less.

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* "Belgique Médicale," Sept. 22nd, 1898, p. 353.

MALFORMATIONS OF THE HYMEN.—Besides imperforate hymen, anomalies in its shape are found. Instead of the usual crescentic shape, it may be circular, or form a double fringe; very rarely it is cribriform, having several openings. More frequent is the hymen septus, in which there are two equal, or nearly equal, openings, with a central vertical septum. This appears to be analogous to the septate vagina; and is in favour of the view held by some anatomists that, in anatomical development, the hymen represents the lower end of the vagina.

In structure the hymen may be unusually tough and resisting. This may prevent coitus, and require forcible dilatation under anæsthetic, or excision; and may even form an obstacle to delivery, delaying the dilatation of the perineum. If vascular as well as unduly developed, the laceration it undergoes at a first coitus may cause serious hæmorrhage.

STENOSIS OF THE OS EXTERNUM.

Causation and Pathological Anatomy.—Congenital stenosis of the cervical canal is situated either at the external or internal os, and extreme stenosis is occasionally found at the former orifice, while it does not occur as a congenital condition at the latter. The intervening cervical canal is comparatively free, being somewhat spindle-shaped. A small external os is usually associated with a tapering, conical cervix, projecting more than usual into the vagina. Frequently also the cervix is flexed forward, so that the os looks in the direction of the vagina, or even still more anteriorly, the posterior lip of the cervix being long, and the anterior lip short. More rarely the cervix is flexed backward. In many cases this form of cervix is associated with imperfect development of the whole uterus, or of the uterus and ovaries. The uterine cavity is then rather less than the normal length, and menstruation scanty. From some associated imperfection, sterility often persists after the stenosis has been cured. The vagina may partake in the same imperfect development, and be smaller than usual, and sexual feeling is often deficient. Cases have been recorded in which an infantile form of pelvis has also been an associated condition. Acquired stenosis may arise from gradual contraction of the os externum in old age, or after the use of caustics, or operations on the cervix uteri. It is also common in old cases of prolapse of the third degree.

Results and Symptoms.—The most marked results of stenosis of any part of the cervical canal are dysmenorrhœa and sterility. Dysmenorrhœa is, however, not invariable. If the menstrual flow is moderate and uniform, and the mucous membrane thrown off is completely disintegrated, no obstruction or pain may result; but if the flow is more profuse, or if there are any clots or shreds of menstrual decidua to pass, spasmodic pain is produced by the efforts of the uterus to overcome the difficulty. The extent both of the spasmodic contraction and of its painfulness depends in very great degree upon the irritability of the woman's nervous system and her sensibility to pain. Sterility is a more constant symptom than dysmenorrhœa; nevertheless it does not imply an absolute hindrance, but only an increased difficulty in the access of spermatozoa to the uterus (*see* section on Sterility). I have met with several instances of women whose os externum would not admit the smallest surgical probe, but who had never suffered the slightest dysmenorrhœa, although they were sterile.

Narrowness of the canal does not directly cause endometritis but tends to a certain degree of retention of secretion, especially if that secretion is unusually abundant and tenacious. Thus, when the uterine canal is dilated for stenosis of the external os, a considerable amount of tenacious mucus is often evacuated from the fusiform cervical canal, which appears to have been slightly dilated from the impediment to the escape of the secretion. Such a plug of mucus in the cervical canal may form some impediment to the menstrual flow, and require more than the average of uterine contractions to expel it. Such contractions may be painful in sensitive women.

Another effect is that, if any microbic inflammation of the endometrium of cervix or fundus has occurred, owing to the lack of free drainage of secretion, sufficient mucus is retained for the microbes to multiply in, and the endometritis does not so readily get well. This effect is more marked, as regards the fundus uteri, in women who have long passed the menopause, and in whom the muscular vigour of the uterine walls is diminished by senile atrophy. It is then commonly the result of acquired stenosis.

The anatomical effect to be expected from a stenosis causing any appreciable obstruction to the escape of the menstrual products or other uterine secretions would be, not a dilatation of the cavity, but hypertrophy of the muscular walls; just as a stricture of the urethra is associated with a small bladder with thickened walls. Although a uterus with congenital stenosis of the cervix is generally small and under-developed to begin with, it is sometimes found that a narrow conical cervix is associated with enlargement of the fundus, especially in unmarried or sterile women who have passed their early youth. This favours the view that such narrowness of the canal may produce appreciable obstruction.

Some authorities deny that any congenital narrowness of the cervical canal can cause obstructive dysmenorrhœa, on the ground that extreme narrowness of the external os may exist without any such symptom; while, at the same time, they hold that dilatation of the canal will cure or relieve a certain proportion of cases of dysmenorrhœa. It seems more reasonable to conclude that a larger canal favours painless menstruation, than that the forcible dilatation produces some other inexplicable effect upon the uterus. It is in favour also of this view that parturition is generally the most effectual cure for the dysmenorrhœa of young women, and that one of its effects is that both external and internal os, but especially the former, remain larger than in nulliparous women. I have occasionally, in performing a plastic operation on the cervix for laceration and eversion after parturition, closed up the external os rather too much, and found that a dysmenorrhœa was so produced, which did not exist before, but which was curable by the passing of metallic dilators. This seems to be as direct a proof as the circumstances allow, that a narrowness of the cervical canal, even if not very extreme, may be the cause of dysmenorrhœa.

Diagnosis.—The external os can be seen through the speculum, and its size tested by that of the sound or metallic bougie which will pass through it. In some cases only a specially small sound or surgical probe can be passed. Even without the speculum or sound the examining finger can generally detect whether there is any abnormal smallness of the os.

While the size of the internal os does not vary nearly so widely as that of the external, it will be found that, in the virgin condition, a dilating sound of 6-cm. diameter can sometimes be passed easily through it, while, in other cases, one of 5-cm. or even 4-cm. diameter passes with difficulty and is gripped when it has passed. The difference may be not only in the absolute initial size but in the dilatability; and the latter is of equal importance when the cervix has to be dilated in menstruation for the passage of clots, shreds of membrane, or even lumps of tenacious mucus.

STENOSIS OF THE OS INTERNUM.

Causation and Pathological Anatomy.—Opinions have differed widely as to the relative frequency of stenosis of the os internum, and some authorities, as Barnes and Schroeder, have considered it so rare as seldom or never to require any operative interference. The majority, however, hold that a relative stenosis at least is not uncommon, and this is the result of my own experience. From autopsies made in a considerable number of nulliparous women, Dr. Peaslee concluded that the average size of the internal os in them is equivalent to a circle $\frac{1}{7}$-in. in diameter, a size which will allow the ordinary sound, whose extremity should be about $\frac{1}{8}$-in. in diameter, to pass pretty easily. In parous* women, who were neither sterile nor suffered from dysmenorrhœa, he found the average area to be nearly double that in nulliparous women. in the majority of cases admitting a sound $\frac{1}{5}$-in. in diameter, though, in a large minority, one from $\frac{1}{8}$-in. to $\frac{1}{7}$-in. only could be passed. Hence, an internal os which, apart from flexion or spasm, will not readily admit an ordinary sound, not too large at the point, is abnormally small. Moreover, it is well known that parous women habitually menstruate more easily than virgins or the nulliparous, and that after a first pregnancy, if no morbid sequelæ remain, the probability of a further pregnancy is increased. It may be inferred that menstruation and conception may be facilitated by dilating the cervix to the average size of that in parous women. As regards dysmenorrhœa, this treatment is especially indicated if the case is complicated by any flexion, by menorrhagia leading to the formation of clots, by the discharge of shreds of membrane, by excessive hyperæmia leading to tumefaction of the cervical mucous membrane at menstrual periods, or by an irritable condition of the nervous system, owing to which a slight cause of obstruction sets up spasmodic and excessively painful uterine contractions.

It is to be remembered that the most definite sphincter in the uterine canal exists at the internal os, and that the size of the os therefore varies according to muscular tonicity. It appears, however, that, after being once completely dilated, as by parturition, the internal os does not usually contract up quite to its original smallness.

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* The word parous is used on the analogy of multiparous and nulliparous, to denote one who has borne one or more children.

Acquired Stenosis may affect the internal os or other parts of the cervical canal. It may result from cicatricial contraction after the use of caustics, or other operative interference, from endometritis, with hyperplasia of the cervix, or from injuries received in parturition.

The **results and symptoms** of stenosis of the internal os resemble those of stenosis of the external os, as already enumerated, and are often combined with the effects of anteflexion.

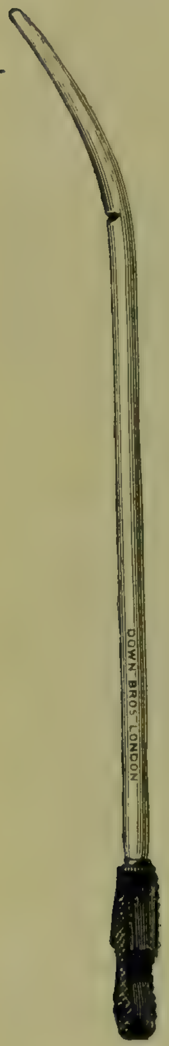

Fig. 89.—Conical Uterine Dilating Sound.

Diagnosis.—The arrest of the sound near the internal os is much more frequently due to flexion than to stenosis. Stenosis can only be inferred when a full-sized sound is arrested, but a smaller sound having the same curve will pass. For this purpose a sound not more than 2-cm. diameter (equivalent to Hegar's dilator No. 2) may be required. It is very rare for the internal os to be too small to admit a sound of 2-cm. diameter, though flexion may render it very difficult to pass it. The most absolute diagnosis of stenosis is obtained if a sound with rather a marked bulbous end is used, and if it is found that there is resistance not only to its passage, but to its withdrawal. The same conclusion may be drawn if a Hegar's dilator or sound of uniform size is passed through the internal os and found to be gripped after its passage. Temporary stenosis, due to spasmodic contraction of the internal os, is distinguished by its yielding after a while to very gentle pressure. A tendency to such spasm may be associated with some primary narrowness. For diagnosis of a degree of smallness which cannot be called in itself morbid in a nullipara, but yet may amount to a relative stenosis under the circumstances already mentioned, larger sounds are required. A convenient instrument for diagnosis, as well as for the purpose of effecting or maintaining dilatation, is a conical sound ⅛-in. in diameter at the point, and enlarging to ⅕-in. at the position corresponding to the internal os (Fig. 89). If this can be passed with ease.

the absence of any, even relative, stenosis is assured; and if it is arrested, the point of arrest will afford an estimate of the size of the internal os, provided that it is ascertained by the finger that the arrest is not due to the external os.

Treatment.—The treatment of stenosis of the external and internal os will be considered together, since both may be affected together in the under-developed uterus; and, even if the internal os is not abnormally small, it is often advisable to dilate it beyond the average nulliparous size in cases of dysmenorrhœa or sterility.

Treatment is only called for if symptoms are present likely to be due to the stenosis. Those most likely to be an indication for dilatation are dysmenorrhœa, with intermittent pain characteristic of uterine contraction, sterility, and uterine leucorrhœa indicating a chronic uterine catarrh, especially if this be associated with dysmenorrhœa, whatever be the character of the pain.

The simplest mode of effecting a moderate dilatation, in cases in which the external os is not excessively minute, is one which may be carried out without an anæsthetic; namely, the passage of successive sizes of the tapering dilating sounds shown in Fig. 89. This is a pattern which I was accustomed to use before the introduction of Hegar's dilators. They require no speculum or drawing down of the cervix, but are used like the ordinary sound, and the direction of their curve can be reversed in the same way by a *tour de maître*, if difficulty arises from flexion of the uterus. On account of their tapering shape, they dilate the external os more than the internal, in accordance with the normal relative sizes of the two apertures.

The most favourable time for such dilatation is just after the end of the period, while there still remains some physiological relaxation of the circular fibres of the cervix. The ordinary sound should be used first, to ascertain the length and direction of the canal, and partially straighten it out, if need be, in cases of uterine flexion, to correspond more nearly with the curve of the dilator, which represents the average curve of the uterus. The dilator is then passed up with gentle pressure, and the handle may still require carrying back toward the perineum, in cases of anteflexion, to get the point round the curve near the internal os. When the notch on the dilator has reached the external os, it should be pushed no farther, for fear that the point might be pushed through the fundus. If the length of the uterus should have previously been found less than normal, the dilator would, of course, only be passed in a little short of the corresponding length. If any dilator causes bleeding, it is generally better not to pass a larger size on that occasion.

By use of these dilators on successive occasions, at not less than a week's interval, the external os may often be dilated up to a diameter of 9—10-mm.; the internal os to 7—8-mm. The pain produced is generally endurable, if the size is only gradually increased. In the case of women who are over-sensitive, or virgins for whom repeated manipulation is undesirable, rapid and more complete dilatation under an anæsthetic is preferable. But the repeated dilatation is probably less likely to be followed by rapid contraction.

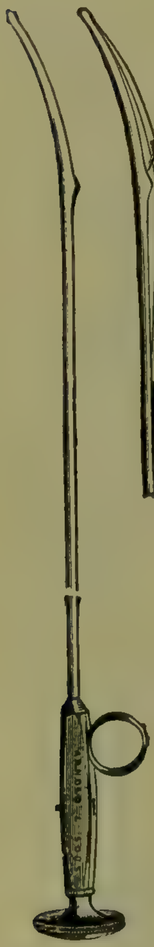

Fig. 90.—Priestley's Dilating Sound.

If the external os will not admit the ordinary sound, whose diameter at the tip is about 3-mm., the dilatation may be commenced with Priestley's dilating sound (Fig. 90), which has expanding blades united at the tip, and worked by a screw at the handle, having an index by which the amount of expansion reached can be watched. This also dilates the external os more than the internal, in accordance with the normal relation between the two. Priestley's dilator requires careful sterilization, on account of the grooves on its inner surface. As ordinarily made, the instrument is scarcely smaller than the ordinary sound. I have been accustomed to use an instrument the bulb at whose tip is barely 2-mm. in diameter, and there are few cases of external os which will not admit this. If the os is still smaller than this, dilatation must be commenced with Hegar's dilator No. 1, or a tapering probe with a fine point. It will then generally be necessary to use a Sims' speculum, and draw down the cervix under an anæsthetic.

If an operation under anæsthetic is undertaken for the cure of the stenosis, there is an alternative between simple dilatation and incision. As a general rule, I consider dilatation alone preferable in the first instance, especially if the external os is normal in position and direction. This may be effected from the commencement with Hegar's dilators, in the same mode as that described for exploration of the interior of the uterus. But I consider it preferable to use the dilating sounds in the manner already described, for the earlier stage of the dilatation, and then to introduce a Sims' speculum, draw the cervix down with vulsella, and begin with about No. 8 of Hegar's dilators.

The extent to which the dilatation should be carried varies according to the resistance met with. If ample time is allowed, and each dilator is left in for about two minutes, if it has passed with difficulty, it may be generally carried up to at least No. 12 Hegar for the internal os, and sometimes No. 13 or 14. The external os may be dilated to one or two sizes larger than the internal. Sometimes the tissue about the internal os is felt to give way as the dilator passes, and frequently the next size then passes more easily than the last. It is then advisable to abandon further dilatation, which would only increase the laceration. Similarly, any marked laceration of the external os should be an indication for stopping the dilatation, but slight notching of its edges need not cause anxiety.

It is convenient to have at hand several dilators of the tapering form (Fig. 47, p. 59), especially between the sizes 8 and 12. If much resistance is met with in using any given size, one of the tapering dilators may be employed, and will generally overcome the difficulty, having much greater power by its wedge-like action. With these, however, greater care is required than with the ordinary form, not to push the dilator on too far and penetrate the fundus. For the cylindrical dilator, having once passed the constriction, passes on without resistance of consequence till it is felt to impinge on the fundus. The tapering dilator, on the other hand, is continuously resisted. It might, therefore, be pressing against the fundus uteri, without the operator being aware of it, unless he is careful to note the length which has been passed into the uterus.

An alternative mode of dilatation is that with the various expanding two-bladed, three-bladed, or four-bladed dilators. The relative advantages and disadvantages of these have already been described (*see* pp. 60-63). As a general rule, I think them preferable in dilatation for stenosis only when the cervix is too thin and conical to afford a firm hold for vulsella, or when too great a resistance is found to the passage of any given Hegar's dilator.

The use of tents appears to involve a rather greater risk of septic absorption than rapid dilatation, and should generally be reserved for those cases in which a more considerable dilatation is required, especially one sufficient to admit the finger for exploration. It is then advisable to use a laminaria tent in the first instance, followed perhaps by a tupelo tent, and complete the process by rapid dilatation under an anæsthetic.

Incisions of the external os may be employed either as an alternative or an addition to dilatation. The former is chosen by those who believe that it is chiefly narrowness at the external os which causes dysmenorrhœa or sterility. But I think it advisable in all cases to dilate the whole canal, both on account of the beneficial effect upon dysmenorrhœa often obtained by dilating the internal os, and because the way is then prepared for curetting in addition, if there is reason to suppose that there is a morbid condition of the endometrium.

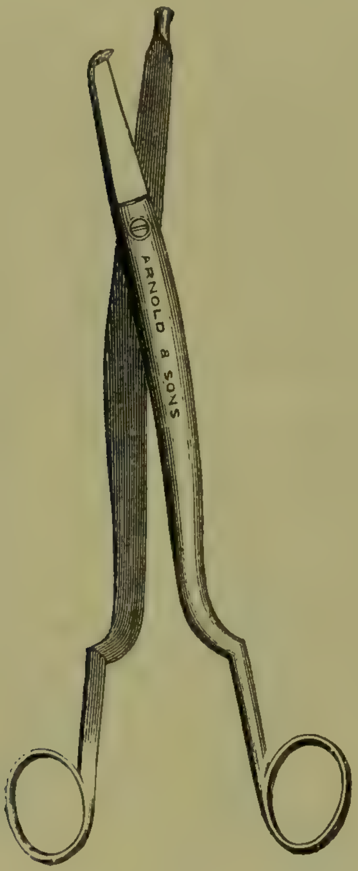

Fig. 91.
Kuchenmeister's Scissors.

As a general rule, the external os can be dilated more easily than the internal. If, however, it is originally very minute and rigid, and signs of laceration begin during the use of Hegar's dilators, superficial radial incisions may be made in several directions, to avoid a single deep tear.

More considerable incisions may be called for chiefly in two cases. The first is that in which the external os contracts up to a small size again after dilatation, and the symptoms recur or are unrelieved, especially if tenacious mucus is found to be retained in the cervical canal. The second is that in which the os, besides being small, is much displaced forward by cervical anteflexion. For such a position of the os may form an element in the causation of sterility by preventing the cervix from dipping into the pool of semen deposited in the posterior vaginal fornix. By an incision backward the cervical canal can then be straightened, and the os brought more nearly into its normal position.

The os has frequently been incised by bilateral incisions, but these have the disadvantage that, in some cases, the anterior and posterior lips tend to become everted as they do after bilateral laceration in labour, and similar effects of irritation from exposure of the lining mucous membrane are set up. It is preferable, even when the os is normally directed, to make an incision backward. One or two more superficial lateral or oblique incisions may be added, with the object that the separated segments of muscle may retract and not so easily unite again.

An instrument designed for incising the cervix uteri is Kuchenmeister's scissors (Fig. 92). These enable the external limit of the incision to be defined very exactly, but they do not divide the internal mucous membrane quite high enough, or make, as is desirable, a trumpet-shaped orifice to the originally fusiform cervical canal. The incision may then be completed by cutting obliquely from the centre of the cervical canal outward as in the line *a c* (Fig. 92). For this purpose Simpson's metrotome (Fig. 93, p. 140), a bistoury caché, the amount of projection of the blade of which is regulated by a screw at the handle, may be used. The metrotome is set to cut pretty widely, its extremity passed up something less than an inch into the cervical canal, and it is then gradually opened as it is withdrawn. A more exact incision can be made with Sims' uterine knife, which has a blade which can be set at various angles upon its handle (Fig. 94, p. 140). The cervix is exposed with a Sims' speculum, the anterior lip held firmly by a tenaculum hook or vulsellum, the end of the knife is passed up about to the internal os, and the incision made downward and outward in the line shown in Fig. 95, p. 141. If either of these instruments is used primarily, the os must first be dilated to some extent to allow of its admission. If the cervix is drawn down with a vulsellum to the vaginal outlet, the incision can be made equally well with an ordinary scalpel. The resulting opening should be wide enough to allow

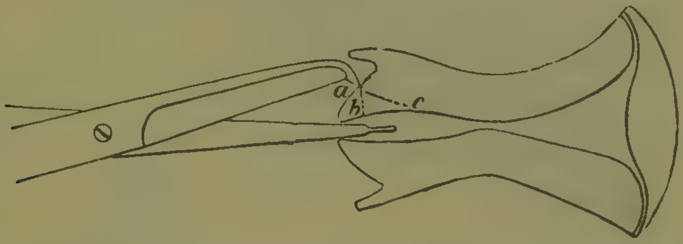

Fig. 92.—Kuchenmeister's Scissors cutting Cervix.
a b, line of incision by scissors; *a c*, line of incision by metrotome.

the tip of the index finger to be passed into the cervical canal. Some means must then be adopted to prevent the closing up of the incision by primary union. The incision may be swabbed over with a solution of chloride of zinc (gr. lx. ad ℥i). This has a mildly caustic effect upon the raw surface, and renders it less liable either to adhere or absorb septic matters. If there is much bleeding, the wound may be swabbed also with a solution of perchloride or subsulphate of iron. If bleeding still continues, a small piece of absorbent cotton dipped in the iron solution may be placed in the incision as a plug. It should have a thread attached, to draw it away after about twelve hours. Up to a week or ten days, a vaginal examination, after careful disinfection of the finger, should be made every second day, and the finger passed between the edges of the incision to make sure that no adhesion takes place.

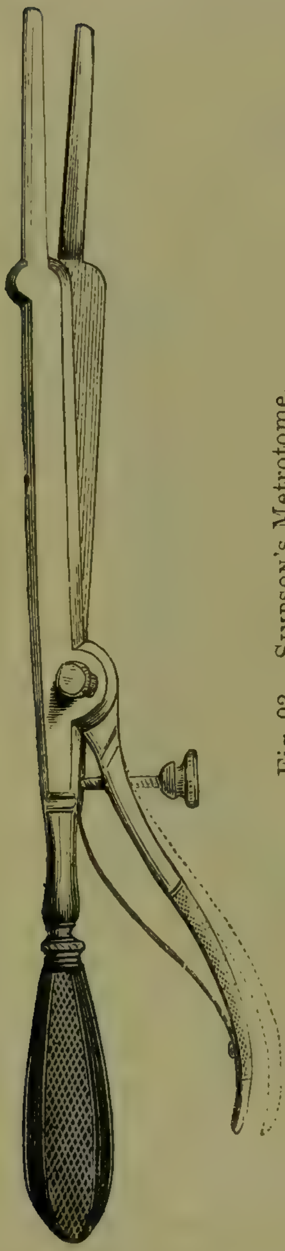

Fig. 93.—Simpson's Metrotome.

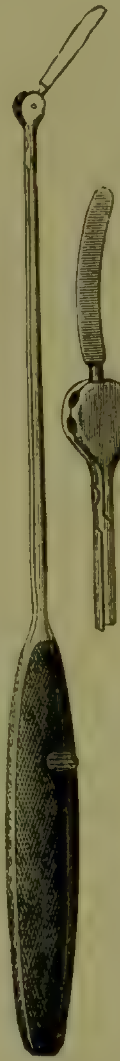

Fig. 94.—Sims' Uterine Knife.

Notwithstanding the prevention of primary union, the external os is apt to contract up again eventually to a small size after these incisions of the cervix backward. A more effectual way of preventing such contraction is to take a V-shaped piece out of the posterior lip. A convenient mode of doing this is to use the parrot-beaked scissors (Fig. 96, p. 142), invented by Dr. Stewart, of Brooklyn, for the purpose of paring the corners of the laceration in trachelorrhaphy. Another way is to seize the centre of the posterior lip with a single-pointed vulsellum; and to cut the central piece out with a scalpel or Sims' knife. At each side of the angle of the incision a stitch is then put, uniting the external and internal mucous membrane. In this way the raw surface left exposed is reduced, and the knots of the stitches keep the surfaces apart, and prevent union taking place without any necessity for repeated digital examinations. Chromic catgut may be used for the sutures, which are then left to dissolve out.

For comparative narrowness of the internal os, dilatation, in one of the modes already described, is far preferable, as a rule, to incision. It corresponds more nearly to the natural process of dilatation in parturition, after which, as a rule, the internal os remains wider than that of the nulliparous uterus. The overstretching of the muscle may also have some effect upon the tendency to painful contraction which exists in spasmodic dysmenorrhœa. Although the sphincter muscle of the internal os always tends to contract after dilatation, it does not usually close up again to an abnormal smallness, and some permanent difference in the size of the canal is produced, when such has existed. On the other hand, deep incisions near the internal os may cause serious bleeding. The incision always heals by granulation, if not by primary union, and the canal may afterwards be as small as ever, with the addition, perhaps, of cicatricial tissue. The only case in which incision of the internal os is worthy of consideration is when the stenosis is an acquired one from a traumatic cause, and consisting already of cicatricial

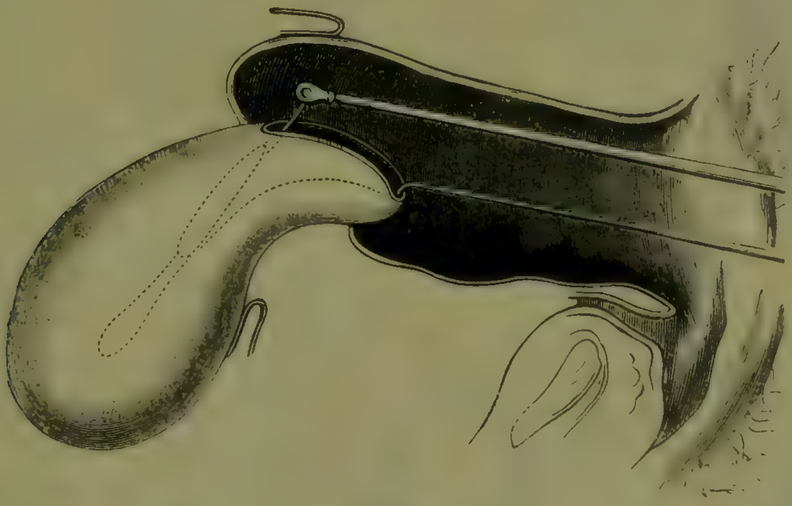

Fig. 95.
Posterior Section of the Cervix by Sims' Knife. (After Sims.)

tissue. Dilatation is then pretty certain to tear it; and it may be preferable to have a limited bilateral incision, rather than a single tear of greater depth.

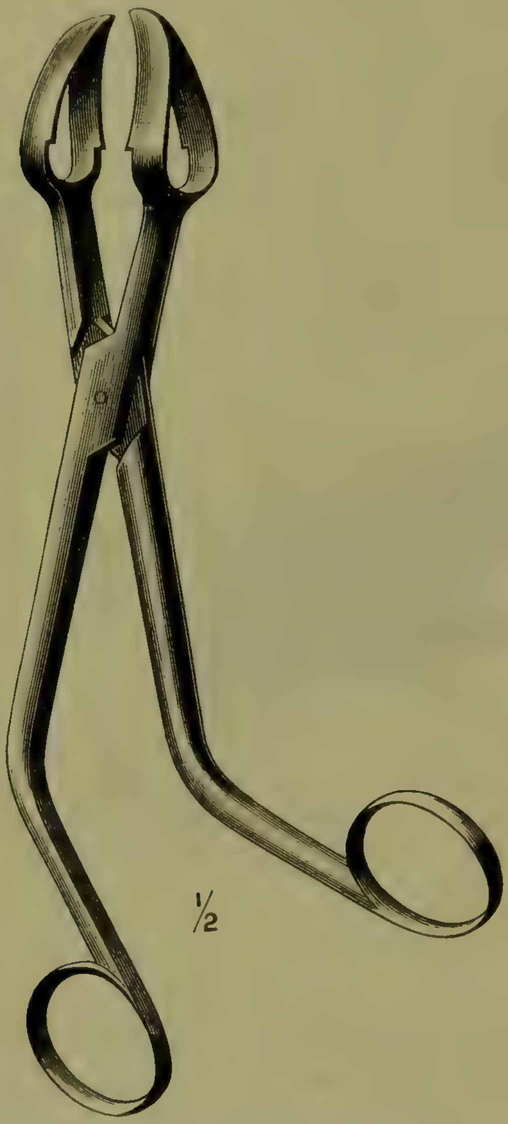

Fig. 96.
Stewart's Parrot-beaked Scissors.

Among instruments devised for incising the internal os is Greenhalgh's metrotome (Fig. 97). This contains an ingenious mechanism by which two blades cut outwards and downwards in a definite curve, and an adjustment for regulating the width of the incision. The incision, however, so produced, even at its smallest, is dangerously wide at the internal os, when the instrument is fully introduced, and it is preferable only to expand the blades to a slight degree, and then cut by withdrawing the whole instrument. A simpler metrotome for use in this manner is that of Dr. Savage, in which each blade forms a shield for the other. Two-bladed metrotomes are liable to cut the two sides unequally, from asymmetry of the uterus or from a difference of sharpness in the blades. With Simpson's metrotome the depth of the second incision is also uncertain, owing to the want of firm resistance to the back of the instrument. A graver objection to both forms of instrument is that, as usually made, they are so large that when incision of the internal os is required they cannot be introduced without preliminary dilatation by a tent, after which it is difficult to judge exactly how much the canal will contract again, and therefore how deep an incision is required.

A safe and convenient instrument, though little known in

Britain, is Peaslee's metrotome (Fig. 98). This consists of a flattened tube, narrowed for its terminal two inches, in which slides a single blade, lancet-shaped towards the point, but blunted at its extremity. There are two blades for each instrument, the cutting portion of one being $\frac{1}{4}$-in., of the other $\frac{3}{16}$-in. wide. A nut and screw on the handle of the blade regulate the extent of its passage into the uterus. The narrow blade is generally sufficient for incision of the internal os. I have used a modified form of this instrument, in which the tube is made round instead of flat, and its terminal portion of smaller size, being only $\frac{1}{12}$-in. in diameter near the extremity. It can then be passed through a very narrow cervical canal, being introduced like the ordinary sound. If the uterus be much flexed, it should first be straightened by means of a small sound, in the manner described under the head of Flexions of the Uterus.

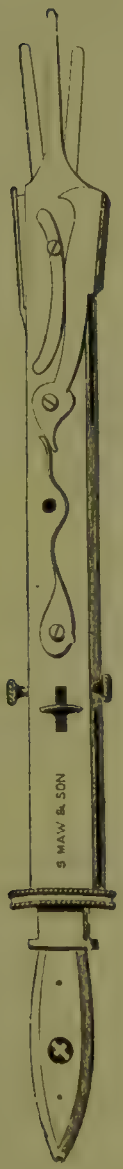

Fig. 97.—Greenhalgh's Metrotome.

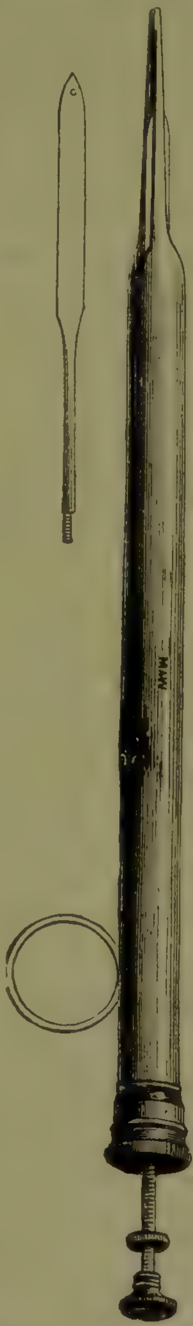

Fig. 98.—Peaslee's Metrotome.

After Treatment.—Minute antiseptic precautions are required not only at the time of operation, but after any dilatation of the uterus, and still more after incision of external or internal os. If douches are used, the antiseptic must be an efficient one, sufficient to prevent the risk of introducing septic microbes in the douche, and it is safer to use water sterilized by boiling. I am accustomed to order douches of perchloride of mercury, 1 in 3,000, twice a day; and a suppository of iodoform containing 5 grains to be introduced at the end of the operation, and after each douche for the first three days. The suppositories should themselves be sterilized on the surface before introduction by soaking in antiseptic, such as perchloride of mercury, 1 in 1,000.

In patients susceptible to irritation from iodoform, or who notice the smell of it as unpleasant, tampons of cotton-wool soaked in carbolized (1 in 40) or iodized glycerine (tr. iodi. ♏x ad ℥j) may be introduced, having a thread tied round by which to withdraw them. Care should be taken by the nurse not to leave an excess of the mercurial solution in the vagina. In very rare cases it may cause, by absorption, physiological symptoms of soreness of gums, or diarrhœa. It should then be changed for another antiseptic, such as chinosol, 1 in 400.

Some authorities recommend the insertion, after dilatation, of an intra-uterine stem to prevent the rapid contraction of the canal. The risk at all times attendant upon the use of an intra-uterine stem is increased after an incision, or even after the slight splitting of mucous membrane which may occur in dilatation. There does not appear to be sufficient advantage in the stem to compensate for the risk; and, in any case, it is liable to set up a certain amount of discomfort and irritation. If necessary, dilating sounds may be passed at intervals of a few weeks afterwards, to counteract the tendency to contract.

After simple dilatation, the patient should be kept in bed for four or five days. If incision or curetting has been performed in addition, the time should be prolonged to ten days.

A narrow cervical canal may be dilated by means of the continuous electrical current, the platinum sound being passed internally, and attached to the negative pole. Enthusiasts for electricity claim that it gives better results than other modes of dilatation. It is sometimes necessary to begin with a metallic dilator or Hegar's dilator to obtain room for the passage of the platinum sound.

The details of Apostoli's method of applying the continuous electrical current are described in the chapter on Fibroid Tumours of the Uterus. The platinum electrode is passed up till the point is within the cavity of the uterus, above the internal os; the insulating sheath should reach up to the external os: this electrode is then attached to the negative pole. The abdominal pad is then applied, and attached to the positive pole of the battery. A current of from 50 to 80 milliampères is slowly turned on, continued for five minutes, and then turned off gradually. After two or three applications, when the canal is somewhat wider, the thick short platinum electrode may be substituted for the ordinary platinum sound, its point being passed just through the internal os.

No anæsthetic is required for the application, and the patient's mode of life need not be restricted, unless an application is made shortly before a period, in which case she should lie up in bed. It is claimed that this method is less painful than mechanical dilatation. The treatment must be used more frequently. Applications twice a week up to ten times are recommended.

CHAPTER VI.

HYPERPLASIA AND ATROPHY OF THE UTERUS.

SUBINVOLUTION, HYPERTROPHY, AND HYPERPLASIA OF THE UTERUS.

Causation.—Of all organs of the body, the uterus is that the tissue of which responds most readily by change of nutrition to any alteration in its vascular supply, or to any form of stimulus whatever. This quality is necessary to render it capable of growing during pregnancy from a weight of about 1¼ to one of about 28 ounces, and of being restored almost to its original size during about six weeks after delivery. Moreover, during the years of active sexual life it is never at rest, even apart from pregnancy, and its mucous membrane passes through alternations of growth, swelling, and exfoliation in each menstrual cycle, accompanied by corresponding changes in the vascular conditions of the whole organ. Modifications in these changes are apt to be associated with hypertrophy, degeneration, or atrophy of its tissue.

Like any other hollow muscular organ, the uterus undergoes hypertrophy if any obstacle exists to the expulsion of its contents. Enlargement may thus be produced by stenosis or flexion, if either of these conditions produces actual obstruction to the canal. The most frequent cause, however, of enlargement of the uterus is subinvolution, or a failure to undergo a sufficient reduction in size after delivery or abortion. For the proper performance of involution two conditions are necessary—first, a suitable diminution of the quantity of blood in the uterine vessels and of the blood-stream through them, associated with an active flow, not retarded by any obstruction in front, or other cause of stagnation; secondly, a sufficient activity in the process of absorption and nutrition. The former is largely dependent both upon the periodical contraction of the uterus and upon the tone of its muscle during the intervals of rhythmic contraction. Subinvolution is thus promoted by muscular atony.

and also by a failure to perform the function of lactation, since the suckling of the child, by reflex action, stimulates the uterus to contract. Other important causes of active hyperæmia and consequent subinvolution are retention of a portion of placenta, membrane, or clots, and inflammatory conditions of the cervix or body of the uterus or of neighbouring tissue, the commonest of these being the effects of mechanical injury to the cervix during labour.

Retention of portions of placenta or membranes mechanically interferes with contraction of the uterus for the time. It has a still more important effect if it leads to sapric or septic bsorption. The pyrexia and constitutional malaise resulting from either interferes with the normal activity of absorption. If septic endometritis results, the inflammation of the uterus still more hinders the local process of absorption, and maintains abnormal hyperæmia for a much longer period. If the inflammation extends to the tubes, ovaries, or adjacent peritoneum the effect is still more pronounced.

Lacerations and other injuries of the cervix have a comparatively temporary effect if they heal perfectly and aseptically. Often, however, they lead to a slight local absorption and cellulitic inflammation, indicated afterwards by cicatricial bands being felt running from the cleft into the broad ligament, without any symptoms of acute inflammation having ever occurred. The effect is then longer and more pronounced; and still more so if the cellulitis is considerable enough to lead to pyrexia and manifest parametritis, with the usual mass of effusion in the broad ligament. Even apart from septic absorption, if the laceration does not heal, and is so marked as to be followed by eversion of the lips of the cervix and chronic irritation from exposure of the cervical mucous membrane, chronic hyperæmia is produced, dating from the time of parturition, and involution is interfered with.

Even injuries and inflammations at a greater distance from the uterus, as those of the vagina, vulva, or perineum, may tend to subinvolution, partly by causing pyrexia, if septic absorption occurs at them, partly by keeping up a general active hyperæmia of the pelvic vessels.

Another cause of subinvolution is a too early return to the upright posture, to muscular exertion, or to marital intercourse. On the other hand, a too prolonged and absolute maintenance of the dorsal position tends to passive hyperæmia, and so renders involution imperfect. An important cause of passive hyperæmia is the partial prolapse or other displacement which often arises after parturition, especially in consequence of a too early getting-up. Any local or general cause of venous obstruction tends to the same effect.

After abortion, subinvolution is still more frequent than after delivery—first, because the uterine mucous membrane, not being naturally prepared for the separation of the decidua, and in many cases having been previously diseased, is more apt to be left in an abnormal condition, or with a portion of placenta still adhering; secondly, because the stimulus of lactation is wanting; and, thirdly, because women, under-estimating the importance of abortion, are more apt to neglect the precaution of resting for a sufficient time, and to return too soon to matrimonial intercourse. A series of abortions following each other at short intervals has an even greater effect in inducing subinvolution. After either delivery or abortion, deficiency of absorption may arise from constitutional debility or malnutrition.

Apart from pregnancy, and hypertrophy due to an obstructed canal, the main cause of uterine enlargement is active or arterial hyperæmia, either reflex or associated with inflammation; but passive or venous hyperæmia also tends to cause the tissue to become infiltrated with serum, and, eventually, to produce overgrowth with degeneration. The causes of active and passive hyperæmia will be considered hereafter.

Pathological Anatomy.—It was formerly believed that, in the process of involution, the large muscular fibres of pregnancy underwent fatty degeneration, became absorbed, and were replaced by new fibres derived from the small elongated cells in the uterine wall. According to Helme,* who studied the process in rabbits, the real change consists simply in atrophy of the muscular fibres and of the cellular tissue in proportion. The large cells do not disappear or undergo degeneration.

Permanent changes take place in the vessels, consisting chiefly of the thickening of all the coats of the arteries, the inner wall, the muscular coat, and the connective tissue surrounding. Hence on section the arteries stand out above the surface more manifestly than in the nulliparous uterus.

In enlargement due to pure subinvolution the structure of the uterine wall is not very different from the normal, but the individual muscular fibres are likely to be of larger size.

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* "Trans. Roy. Soc. Edin.," vol. xxxv. part 2, No. 8.

In enlargement of the uterus, the result solely of obstructed outflow, the pathological condition is that of hypertrophy of the whole organ, but more especially of the muscular fibres. The muscular structure may also be hypertrophied equally with the cellular tissue in the earlier stages of a subinvolution which has arisen without the existence of any metritis, either as a cause or complication. In the great majority of cases, however, of subinvolution and other forms of enlargement, microscopic examination shows an undue proportion of fibrous tissue compared with muscular fibre. This leads at length to an induration of the tissue which, in the early stage, was softer than normal from infiltration with serum. In the cervix especially this induration is manifest to the finger, and may lead to an erroneous diagnosis of scirrhous cancer, an error which formerly was probably often made. As might be expected from the well-known tendency of chronic inflammation to lead to induration by the production of fibrous tissue, this relative increase of cellular, as compared with muscular, elements is greatest when chronic inflammation, whether of body or cervix of the uterus, is the cause of enlargement, and, in mixed cases, it is more marked in proportion to the preponderance of the inflammatory element. It may, however, be a degenerative change under the influence of venous stagnation, or due to constitutional causes of degeneration of tissue. Thus a fibrous induration of the uterus may be associated with a similar condition in kidneys or liver, or both, and be due to a digestive or uræmic toxin, or to whatever be the cause of the so-called arterio-capillary sclerosis.

The anatomical state finally reached, which has been variously called areolar hyperplasia, sclerosis of the uterus, or congestive hypertrophy, may thus be brought about by different causes——either by a chronic inflammatory process, or by conditions in which there is no proof of inflammation as commonly defined. Whichever name be chosen, therefore, should be reserved for the result produced. and not applied to the process leading up to it. The increase in thickness of the uterine walls is commonly greater in proportion than that of the length of its cavity, so that, apart from causes of descent and tensile elongation of the cervix, the organ assumes a more globular form. The cavity of the uterus, as measured by the sound, is usually not longer than 3½-in. or 4-in.

Varieties.—In most cases the hyperplasia affects both the body and neck of the uterus, though it commonly preponderates in one or other of these, and may be confined to one portion alone. When it is due to lacerations or other damage in labour, the cervix is generally most affected, but the fundus participates in the enlargement, from the hyperæmia affecting it also. Among special forms of hyperplasia is hypertrophic elongation of the supra-vaginal cervix. This is generally due in the main to the tension of the vaginal wall, or prolapsed cervix, associated or not with causes of hyperplasia either primary or consequent upon the prolapse, and it will be discussed under the head of Prolapse of the Uterus and Vagina. Another form is hyperplastic elongation of the vaginal portion of the cervix, to be distinguished from hyperplasia affecting the cervix in its breadth, or in all its dimensions (Fig. 99). This is a comparatively rare affection, and is more usually found in virgins or nulliparous women, being in the first instance a congenital condition. It generally leads to prolapse of the first or second degree; the prolapsed cervix then becomes congested or inflamed, and the hyperplasia is thereby increased.

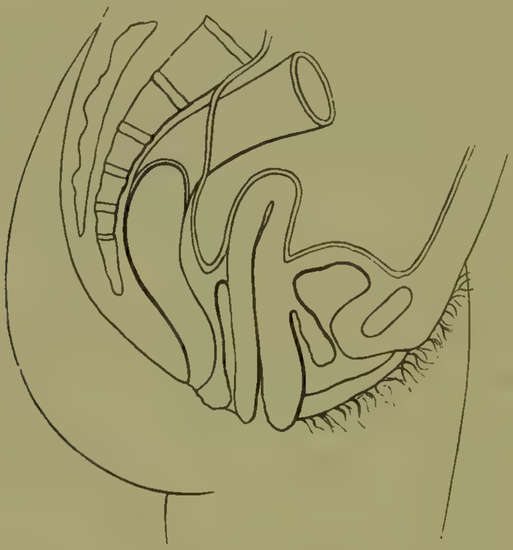

Fig. 99.—Hypertrophy of Vaginal Cervix.

Results and Symptoms.—Enlargement of the uterus is a very common cause of displacement, especially of prolapse, retroversion, or retroflexion, in consequence of the increase of weight, and the softness of tissue which generally exists in the early stage. Uncomplicated hyperplasia, especially when recent, is liable to cause dragging pain in the back, hypogastrium, and loins, from the greater strain upon the ligaments. Increase of surface in the uterine cavity naturally leads to an augmented menstrual flow, except in the late stages of hyperplasia, when the tissue is degenerated and anæmic. The same cause leads, from increase of secretion, to a leucorrhœa, which is only slight, and unaccompanied by any change in the character of the secretion, unless, as is more often the case, the subinvolution is accompanied by endometritis. In the early stage of subinvolution after delivery there is generally sufficient associated hyperæmia to lead to the recurrence of menstruation at an early period, notwithstanding the opposing influence of lactation. The remaining symptoms of hyperplasia are due, for the most part, to the hyperæmia, endometritis, metritis, or displacement, with one or more of which it is almost always associated.

Diagnosis.—Hyperplasia of the cervix is readily detected by vaginal touch, and its stage is indicated by the hardness or softness of the tissue. The differential diagnosis from cancerous degeneration is described under the head of Cancer. In hyperplasia of the body of the uterus, the enlargement is detected by the bimanual examination, and the thickening of the wall is generally found to be greater than the increase in length. The length of the cavity is revealed by the sound, if its use is not contra-indicated.

The most difficult point in diagnosis is to distinguish between simple hyperplasia and enlargement due to a fibroid tumour. In the latter case, the external surface of the uterus is often felt to be irregular. If, however, the tumour bulges internally, it may be necessary to dilate the cervix sufficiently to allow the index finger to be passed into the cavity of the uterus before the unequal enlargement can be detected. In cases in which the presence of a very small fibroid causes great hyperplasia of the whole uterus, the tumour is especially liable to escape recognition. If the length of the cavity measured by the sound, apart from any prolapse likely to cause tensile lengthening, is much over 4-in., there is a presumption in favour of the presence of a fibroid tumour.

From early pregnancy, hyperplasia is usually distinguished by the greater sensitiveness of the uterus, and by the persistence of menstruation, whereas, in pregnancy, there has usually been amenorrhœa at some period, though hæmorrhage may be present when abortion is threatening. This distinction, however, may fail in the case of hyperplasia associated with the commencement of climacteric irregularities. The most valuable sign by which to distinguish the pregnant uterus is the more globular enlargement of the body as felt bimanually, and its greater softness and indistinctness, due to the chiefly fluid nature of its contents. With this is associated, in the case of pregnancy, "Hegar's sign," due to the softened and empty condition of the lower part of the fundus. On bimanual examination the isthmus of the uterus, between fundus and cervix, is felt to be soft and indefinite, so that, in some cases, the fundus and cervix feel almost like two independent bodies. Variation in the consistence of the uterus, due to the alternation of contraction and relaxation, may often be detected early in pregnancy, and is a very valuable sign if it exists, since it is far more marked in pregnancy than in any other uterine enlargement. In molar pregnancy, however, the uterus may never be soft or flaccid. Softening of the cervix is an important sign, if present, but it is often absent in the early stage of pregnancy in a multipara.

Hypertrophy of the *vaginal* cervix, causing the cervix to protrude externally, is distinguished from prolapse, with or without hypertrophy of the *supra-vaginal* cervix, by the condition of the vaginal fornices. In the former the fornices are not depressed, or only slightly depressed in consequence of accompanying descent; and when the cervix is pushed back the fornices will be found at their normal level, while the cervix still projects low down in the vagina. In the latter they are depressed to a marked degree.

Treatment.—(1) *Prophylactic.*—The most important part of prophylactic treatment consists in the judicious management of the puerperal state and of abortion, in which should be included the utmost care to avoid causes of septic or traumatic inflammation. Rest for a due period, mainly in the horizontal position, should be observed, but a too continuous maintenance of the dorsal position, especially on a soft bed, should be avoided, as tending to cause venous stagnation and retain discharges. The child should be suckled, if possible, for at least from four to six weeks, even if the mother's milk requires to be supplemented. It would be of advantage if, in all cases, at the end of the puerperal period an examination could be made to ascertain that no displacement had arisen, or lesion of cervix remained. Whenever sanguineous or muco-purulent discharge continues too long after delivery, such an examination should not be omitted. After abortion in the early months, rest, more or less complete, and abstinence from coitus for as much as four weeks should be enjoined. After miscarriages between the third and sixth months, much more prolonged rest and care are usually called for than after normal delivery at full term. It is also of essential importance in the immediate treatment of abortion to secure the complete evacuation of the uterus. After abortion, and also in the case of failure of lactation after delivery, or where there is any pyrexia, or any local cause likely to interfere with involution, it is desirable to administer a course of ergot for several weeks to promote uterine contraction.

According to Herman,* in a series of cases in which ergot was given, involution was less often delayed than in a series of cases in which ergot was not given; but he considers that, as shown by Blanc,† the drug has no effect upon normal involution, but only when any condition is present which prevents proper contraction of the uterus.

(2) *Curative.*—In the earlier stages of hyperplasia a cure may result from the removal of its cause. Thus, in cases of subinvolution within a few months after delivery, great good is effected by remedying displacement, by curing cervical inflammation—one of the commonest causes which interfere with the normal process of involution—and by treating hyperæmia by suitable means. It is also of importance to remedy any constitutional debility or anæmia, which often accompanies lactation, and by which the activity of absorption may be impaired. For this purpose the most valuable drugs are iron, quinine, and strychnia. In all recent cases of subinvolution, a course of ergot, or ergot combined with strychnia, may be given with advantage for three months or so.

In the case of enlargement of the uterus associated with hæmorrhage within a few months after abortion, the choice of treatment depends upon the question whether the subinvolution and hæmorrhage are common results of a piece of placenta remaining attached within the uterus. This will generally be found to be the case if the hæmorrhage has proved so severe as to produce marked anæmia, or if it is irregular and independent of menstruation; and the probability is increased if the cervix is found to remain unduly open. In some cases even the internal os may remain so much open as to admit the finger, and allow it to detect the foreign body within. On the other hand, if the cervix has closed up to a small size, it may generally be inferred that, if any piece of ovum remains within, it is only a small fragment. If the cervix does not fully admit the finger, it should first be dilated either by mechanical dilators (*see* p. 58) or tents.

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* "Obstet. Trans.," vol. xxx.

† *See* "Lancet," 1892, vol. ii. p. 1160.

If offensive discharge is present, a tent should be avoided. Otherwise, if the cervix is small, it is advisable to commence with a laminaria tent, introduced twelve hours beforehand, since otherwise the cervix can rarely be dilated enough to admit the finger for exploration without splitting the lining near the internal os uteri. On removal of the tent, the dilatation is continued with Hegar's dilators, as described at p. 58. Usually it is desirable to proceed up to dilator No. 21 or No. 22, to allow sufficient space for exploration by the index finger.

For evacuating the uterus the finger is the best instrument. An anæsthetic should first be administered. It is essential that the bladder should be completely emptied, for this allows the fundus to be brought much more easily under command of the external hand. The patient being in the dorsal position, the index finger alone is to be passed into the uterus, while the half-hand is introduced, if necessary, into the vagina, the remaining four fingers being flexed upon the palm. The other hand is placed upon the abdomen, and its ulnar edge pressed in above the fundus so as to bring it close to the pubes. The uterus can then be pressed down so that, unless the uterine cavity is excessively lengthened, the finger can reach completely up to the fundus, without the necessity of passing the whole hand into the vagina; and usually this can be accomplished without passing more than one finger into the vagina. If the uterus is at all retroverted, the finger, introduced into the cervix, may conveniently be used as a repositor, to bring it into a position of slight anteversion. If this cannot at once be effected, the fingers in the posterior vaginal fornix should first push up the fundus, until the external hand can get behind it, and the index finger then be passed into the uterus. It is very rarely that any other instrument than the finger is required. In some cases, however, a pair of ovum forceps, with flat serrated blades locking closely together, may be useful to remove a piece of tissue which has been wholly or partially detached. If any piece of placenta is found so firmly adherent to the uterine wall that it cannot be separated by the finger, a curette may be used to detach it. This, however, is very rarely necessary, since the placental tissue can be gradually broken down by the pulp of the finger till all is removed.

In some cases there may be a difficulty in getting the uterus into the requisite position of moderate anteversion. Assistance may then be derived from the tenaculum forceps shown in Fig. 26, p. 40. The forceps are fixed into the anterior lip, the uterus drawn down sufficiently to allow the finger to penetrate well into the cervical canal, and the handles are then given to an assistant to hold, while the external hand obtains command of the fundus. If, however, an offensive discharge is present, it is better to avoid the puncturing of the cervix involved in this method. After the operation, full doses of ergot should be administered for a time, and complete rest enjoined. Antiseptic vaginal injections should be used, such as a solution of perchloride of mercury, 1 in 3,000, twice a day; and, if any offensive discharge should appear, or febrile symptoms arise, the uterus itself should be syringed out with a weak solution of perchloride of mercury 1 in 3,000, carbolic acid, or iodine.

If the patient has been suffering from pyrexia and other symptoms indicating septic endometritis, it is advisable after the operation to plug the uterus for twenty-four hours with a strip of antiseptic gauze, and so obtain the continuous action of an antiseptic upon the mucous membrane. Sterilized moist iodoform gauze, 10 per cent., is the best for the purpose. In the absence of septic symptoms, the operation causes less disturbance if no intra-uterine plug is used, and it is rarely necessary to use intra-uterine douches after the operation itself.

When the cervix is closed, and the hæmorrhage not serious in quantity, there is a probability that the case may be one of simple subinvolution, with some hypertrophic condition of endometrium. The effect of treatment by rest and the administration of ergot and other uterine styptics should then first be tried. If hæmorrhage cannot be permanently checked by this means, the cervix should be dilated for exploration of the uterine cavity.

In the case of hæmorrhage persisting after delivery at full term, the treatment should be conducted on the same principles. The retention of some portion of placenta, membranes, or clot must be regarded as a not improbable contingency, even though it may have appeared certain that the placenta and membranes came away intact.

Advocates of electrical treatment of the uterus recommend it for the earlier stages of subinvolution, when the uterus is large and soft, often displaced backward or downward, and menstruation excessive.

It is advised to begin by using the Faradic induced current. A sound-electrode is passed into the uterus, and a pad connected with the other pole is placed upon the abdomen. A current as strong as can be borne is then applied for ten or fifteen minutes. This is repeated three or four times a week for a fortnight or three weeks. Then the application of the continuous current according to Apostoli's method is commenced (*see* chapter on Fibroid Tumours of the Uterus). The positive pole is applied internally by a platinum sound-electrode, the cervix being protected by an insulating sheath. A current up to 100 milliampères, but weaker for the first few applications, is gradually turned on, maintained about eight minutes, and then gradually turned off. This is to be repeated twice a week up to fifteen or twenty applications.

In the earlier stages of hyperplasia, wholly or partially resulting from inflammation, absorbent remedies may be tried in the manner described under the heading of Chronic Endometritis and Metritis. The later stage of fibroid induration is little susceptible to treatment, and is scarcely, if at all, affected by absorbents such as mercury or iodide of potassium. A degree of tolerable comfort may, however, frequently be obtained by treating the coincident hyperæmia, or displacement, though a tendency to relapse commonly remains. It is only in exceptional cases, and after fair trial of such means, that it is desirable to have recourse to the more surgical modes of treatment to be hereafter mentioned. The most powerful of all influences in diminishing the size of the uterus is the involution after delivery, during which even fibroid tumours may sometimes disappear. All means should therefore be taken (by curing any other morbid condition which may be discovered, more especially endometritis) for removing the sterility which commonly accompanies the late stage of hyperplasia.

It was formerly common, in cases of subinvolution and hyperplasia of the uterus, especially when the cervix was the part most affected, to use active treatment to the cervix by means of the actual cautery, such as Paquelin's, or chemical caustics. The idea is to set up a process somewhat analogous to involution. A transient inflammatory hyperæmia is produced, on the subsidence of which the blood supply is contracted, and absorption becomes more active.

For the application of heat, Paquelin's benzoline cautery is the most convenient means, the application being made to one or both lips of the cervix, away from the cervical canal, through a large Fergusson's speculum of wood. Potassa fusa cum calce and potassa fusa have also been used.

In my opinion it is far preferable, if any such proceeding is called for, to perform a plastic operation. Hyperplasia of the nulliparous cervix is rarely found, except in the case of fibroid growth, which is not amenable to this kind of treatment, and congenital elongation, which is treated by amputation. It is almost always a parous cervix which is the subject of irregular hyperplasia. Almost invariably the hyperplasia will be found to have commenced in some laceration in labour, followed by adenomatous hypertrophy of the lining mucous membrane located on the tissue remaining between the clefts. If this condition be treated by the plastic operation described in Chapter VII., the redundant tissue, especially the hypertrophied and occluded glands, is entirely removed, and the cervix reduced to a normal size, while no tissue is burnt or damaged, and no cicatricial tissue is left behind. The local depletion associated with the operation relieves pain for the time being. The traumatic congestion following the operation has a similar effect to the burning or application of caustic, though a less painful one, and is followed by a reaction in which the blood supply is contracted, and a process analogous to involution goes on. The diminution of blood supply is aided by the removal of the glandular hypertrophy which kept up hyperæmia. In this way benefit is derived not only to the cervix, but to the fundus which was congested in sympathy.

Treatment of Hyperplasia of the Vaginal Cervix.—Elongation of the vaginal, unlike that of the supra-vaginal cervix, is commonly, in the main, a primary affection, the cause rather than the consequence of prolapse, and hence the only satisfactory treatment is the removal of the redundant portion. The only difficulty of the operation is that of dealing with the hæmorrhage, which is apt to be considerable, especially when the tissue is soft, while the arteries cannot easily be secured by ligature or torsion.

The best method of amputation is the plastic one. The patient is placed in the lithotomy position, secured by leg-rests attached to the table, or Clover's crutch. The cervix is drawn down by vulsella to the vulval outlet, and excised in a wedge-shaped manner, the anterior and posterior flaps being left longer than the sides. A short-bladed Sims' speculum meanwhile retracts the perineum.

The amputation is facilitated if the cervix is first slit up laterally to as high a point as is thought desirable, being thus divided into an anterior and posterior lip. Vulsella are placed on the anterior lip to keep the uterus held down, while the posterior is amputated. When this is done, two or three sutures of stout silkworm gut are applied to attach the margin of the posterior flap to the edge of the cervical canal, the sutures being brought out in the middle over the raw surface (Fig. 100) and tied up. The vulsella are then transferred to the shortened posterior lip, and are secured by passing one blade into the cervical canal and the other close up to the vaginal reflection, so that they grasp the lip above the level of the incision and sutures. The anterior lip is then amputated in the same way, and its anterior margin similarly stitched to the edge of the cervical canal. The lateral margins of the flaps only now remain. These are secured by stitching the anterior margin of the anterior flap on each side to the posterior margin of the posterior flap, the tissue in the middle being infolded, as shown in Fig. 100. In this way the flaps are inverted over the raw surface, which their mucous membrane completely covers in. The length of the flaps must have been planned out beforehand, so as to leave a cervix of about normal size.

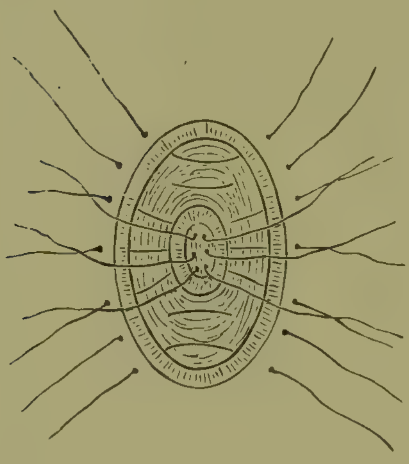

Fig. 100.
Mode of placing Sutures after Amputation of the Vaginal Cervix. The right hand of the figure indicates the anterior lip, the left hand the posterior lip, of the cervix.

To check hæmorrhage during the operation, pressure forceps may be placed temporarily upon any arteries which spurt. But the hæmostasis depends mainly upon the pressure exercised by the united surfaces on each other, and the sutures must be tied tightly enough to secure this, and no raw surface be left exposed. If at the end of the operation any bleeding continues between the edges, one or two more sutures may be applied, to exert additional pressure.

In general, there is no harm in the amount of local depletion which occurs, and it tends to relieve any previous tenderness. If the patient is very anæmic, and it is desired to limit the bleeding, a bloodless operation may be carried out as follows:—

The cervix having been drawn down outside the vulva by vulsella, and the lowest point of the bladder ascertained by the sound, a strong hare-lip pin is passed through the cervix from before backward, about a quarter of an inch below this point, and another similar pin at right angles to the first. A piece of thin india-rubber tubing is passed twice round, above the pins, and tied tight enough to prevent bleeding. Flaps are cut below the level of the pins, and united firmly by sutures in the manner already described, bleeding being absolutely abolished during this process. The elastic ligature is then removed. With the reaction after compression of the vessels, some oozing generally takes place between the edges. If this does not cease in a few minutes, some additional deeper sutures may be passed, at points intermediate to the more superficial ones, both at the sides of the cervix, and between the anterior and posterior lip and the cervical canal.

The plastic method of operation has a great advantage over amputation by the galvanic cautery, in that it leaves no cicatricial surface exposed, nor any tendency to contraction of the cervical canal therefrom.

SUPERINVOLUTION AND ATROPHY OF THE UTERUS.

The process of involution may be excessive, although this fault is very far more rare than the opposite, and instances have even been recorded in which the uterus has been so reduced in size after parturition, that its presence could not be detected. Such atrophy may occur after normal delivery in ill-nourished women, who have a tendency to premature decay, or it may be the result of general or local puerperal disease. Atrophy of the ovaries is generally found to be coincident, and this may be the primary change.

Atrophy of the uterus may also arise gradually in ill-nourished subjects, apart from parturition, and may lead to a premature menopause. There is a greater tendency to this in women in whom ovarian activity has throughout life been below par. Senile atrophy is a normal condition after the menopause, but does not usually proceed to a considerable extent till after the age of sixty. The vaginal portion and os then become especially small, and not infrequently stenosis or even occlusion of the cervical canal occurs. The vagina shares in the atrophy, and becomes funnel-shaped, while the external generative organs also waste.

Results and Symptoms.—The symptoms of superinvolution or premature atrophy of the uterus are scanty menstruation or amenorrhœa, and sterility.

Treatment.—In most cases it is preferable not to interfere, unless there are symptoms of unrelieved ovarian molimen. Otherwise, if the natural period of the menopause has not been nearly reached, and atrophy is not extreme, it may be desirable to try some of the means of local stimulus which will be described under the head of amenorrhœa. The same general and hygienic treatment as in the case of primary failure of development (p. 122) should be added.

CHAPTER VII.

HYPERÆMIA AND INFLAMMATION OF THE UTERUS.

ACTIVE HYPERÆMIA OF THE UTERUS.

As the uterine tissue is more prone than any other in the body to respond to stimuli by a change in its nutrition, so the uterus is, most of all organs, liable to physiological active hyperæmia, which readily passes into a morbid excess. Thus, hyperæmia occurs at each menstrual cycle, both during the period itself, and during the stage of growth and intumescence of the uterine mucous membrane which immediately precedes it. The tissue of the uterus and that around it are also, in a measure, erectile, and a more intense and transient hyperæmia thus arises through arterial dilatation under the influence of coitus or sexual excitement. To such forms of transient hyperæmia the term fluxion has been applied. While in the healthy uterus they are innocuous, they may become, in morbid conditions, serious sources of mischief.

The same susceptibility of the uterine vascular system to stimulus leads to a more chronic active hyperæmia, as the result of any source of reflex irritation. This may arise from any morbid condition or undue activity of the ovaries, from inflammation or other lesion of the cervix, or from more distant sources, as inflammation of the vagina or vulva, from sensitive caruncles of the urethra, or even from pruritus vulvæ. The same effect may be produced by any social conditions, or individual peculiarity, which may lead to undue, or especially to premature, development of the sexual emotions. Masturbation especially, though it does not necessarily produce any physical injury in adults, is apt to lead to hyperæmia of uterus as well as ovaries, when excessive. Again, a fibroid or cancerous growth in one part of the uterus causes hyperæmia and consequent enlargement of the whole, and the same result may be produced by a neighbouring cellulitis or peritonitis or tubal disease. The persistent excess of vascular pressure leads to swelling of the tissue by effusion of serum, and eventually to hypertrophy. The pressure upon the nerves consequent upon swelling may lead, in persons of acute sensibility, to tenderness and pain, such as in them may be produced also by the fluxion of menstruation. Thus, many of the conditions usually associated with inflammation may be present, while it cannot be proved that positive inflammation exists.

The uterus has also an anatomical peculiarity which brings chronic hyperæmia of its tissue, when associated with endometritis, into close relation with chronic parenchymatous inflammation. Most mucous membranes are separated from the structures lying beneath them by a layer of loose areolar tissue; and, in such case, catarrhal inflammation of mucous membrane may exist without any perceptible implication of the muscular walls beneath, as is found to be the case in such mucous membranes as that of the intestines or of the air-passages. The mucous membrane of the uterus, however, is itself of a dense character, consisting mainly of closely-packed round or slightly elongated cells, and is intimately connected with the muscular wall, without any intervening loose layer. The extremities of the glands even dip more or less into the muscular layer; and it has been maintained, with much probability, by Sir John Williams, that a considerable proportion of the thickness of the uterine wall really corresponds in development to the muscularis mucosæ, though in the human subject no line of demarcation can be traced. We may conclude, therefore, on anatomical grounds, that, if endometritis exists, the inflammation is not likely to be strictly limited to the mucous membrane, but will affect the uterine walls to some depth. The case may be compared to that of a sore and inflamed spot on the tongue, or on any sensitive surface, which gives rise to redness, swelling, throbbing, tenderness, and pain over a considerable region in its neighbourhood. The hyperæmia may be due mainly to reflex nerve irritation ; but there is a zone of inflammation of lower degree, arising by continuity of tissue around the inflamed point, through which there is a gradation from simple hyperæmia up to the more acute inflammation.

The relation between mere engorgement and inflammation of the uterus has given rise to more divergence of opinion than any other in gynæcological pathology. Some distinguished authorities have omitted chronic metritis entirely from their nosology, while others, and the more numerous, have regarded it as I believe, with greater accuracy, as one of the commonest of the special diseases of women. The difference is fortunately not so much with regard to the true nature of the condition present, or its treatment, but rather as to the question of definition—within what limits the word inflammation is applicable. The strongest argument for the view that, in most cases of hyperplasia of the body or cervix of the uterus, chronic parenchymatous inflammation plays some part, appears to be the fact, universally acknowledged, that in the later stages there is almost invariably an increase of areolar at the expense of muscular tissue, and eventually fibroid induration. In most cases we may find at some stage the old-fashioned surgical criteria of inflammation, namely, pain, redness, swelling, and, if not heat, at any rate the arterial hyperæmia which, on the surface of the body, produces local heat. To these is added a cell proliferation, not leading, as in acute inflammation, to unstable products, but to products of a lower grade than the normal tissue of the part—a characteristic effect of chronic inflammation. This occurs even when there is no cause of passive hyperæmia, and no constitutional tendency to degeneration or sclerosis of the organs; whereas we might expect that, if the condition were solely one of active hyperæmia, the result would be true hypertrophy, such as occurs under the stimulus of pregnancy. Such a production of fibroid tissue is a characteristic result of chronic inflammation in other organs, as the lungs, liver, or kidneys, although in them also the distinction of inflammatory from degenerative changes has been the subject of much divergence of opinion.

Sexual excess may also lead to effects in which it is very difficult to draw the line between active congestion and inflammation. Even when the former only exists, it may produce a congestive hypertrophy which is identical with, or not easily to be distinguished from, that which results from a chronic inflammation.

Treatment.—The first effort should be to remove the inflammation which active hyperæmia reveals, or the cause which sets it up by reflex action. Of such causes, apart from endometritis proper, or inflammation of the lining membrane of the body of the uterus, the most common are ovarian irritation, and erosions, fissures, or other lesions of the cervix.

Of internal remedies which have a direct influence upon hyperæmia, the most powerful is ergot, which acts in some measure by contracting the arteries, but in the main by its influence upon the muscular walls of the uterus. Half-drachm doses of the liquid extract of ergot, or of the liquor secalis ammoniatus, may be given three times a day in chronic hyperæmia, especially if associated with menorrhagia or metrorrhagia. A similar influence, though in less degree, appears to be exerted by digitalis and strychnia, and these may often be usefully combined with ergot, while the general tonic effects of strychnia are at the same time valuable.

Bromide of potassium, while acting as a general vascular and nervous sedative, has a special influence on the pelvic organs, which depends, in part at any rate, upon its effect as a sexual sedative, in which respect it is more trustworthy than any other drug. It may be given in doses of twenty or thirty grains, combined with ergot or not, or for long periods in smaller doses, from ten to fifteen grains. Its supposed general depressant effect upon the system is not much to be dreaded, especially if a tonic be given in combination, but in susceptible subjects it is apt to produce the bromic acne. To avoid this inconvenience the medicine may be discontinued for one week out of four; or, if this is not sufficient, five-minim doses of liquor arsenicalis may be given in combination with it. The bromides tend to diminish the quantity of the menstrual flow and lengthen the intervals, and therefore do not act so well in hyperæmia from suppression of menses, or associated with scanty menstruation. In some cases of the latter, however, they may be beneficial when given in combination with iron. Bromide of ammonium and hydrobromic acid appear to have a similar effect to bromide of potassium, although Binz has maintained that the virtue lies in the potash and not in the bromine, and that chlorate of potash is equally efficacious. Iodide of potassium is especially useful in hyperæmia dependent upon ovarian enlargement or irritation, and in such cases it is desirable to combine it with the bromide. Quinine and the mineral acids are useful, especially in the more chronic stage, while quinine in large doses has a direct effect in promoting uterine contraction. In all cases of hyperæmia diet should be unstimulating, and alcohol should be avoided or taken sparingly.

Local Depletion.—Local depletion often gives great relief both in active and passive hyperæmia, and also in a combination of the two, especially when the hyperæmia is a sign of inflammation, or much local pain and tenderness exist. It may be performed either by puncturing or scarification, or by leeches. The former is the most convenient, and is generally to be preferred in the earlier stages of hyperæmia or metritis, while the uterus is soft. It has the advantage that it is not liable, like the suction of a small quantity of blood by leeches, to set up a renewed fluxion to the part affected. A cylindrical speculum should be used, and two or three punctures made with a sharp-pointed bistoury, spear-headed scarificator, or triangular needle held in a pair of forceps. The lancet-pointed knife, mounted in a handle and covered with a cap, shown in Fig. 101 is a convenient instrument.

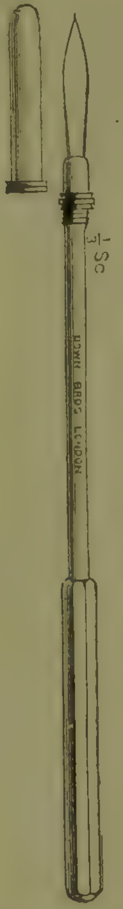

Fig. 101.—Uterine Scarifier.

A sponge wrung out of hot water may afterwards be passed occasionally over the cervix to prevent clotting in the mouths of the vessels. One or two ounces of blood should be abstracted, and additional punctures may be made, if necessary, till this amount is obtained. If, as is often the case, there are occluded glands in the cervix, the punctures may be made to serve the double purpose of opening the glands and depleting the uterus.

Leeches are rarely used nowadays, since they cannot be sterilized. If they are ever employed at all, the cases most suitable for their use are those in which it is difficult to obtain sufficient blood by puncturing, as is usually the case in the later stages of hyperplasia of the cervix, and also those in which there is suppression of menstruation or too scanty a flow, so that it is advantageous to excite some temporary fluxion to the uterus. The cervix should be brought into the field of a large cylindrical speculum and the os plugged with a small piece of cotton-wool to which a thread is attached for its removal. If this precaution be neglected, a leech may bite within the cervical canal, or crawl into the uterus and cause severe pain, although, in such a case, it is usually expelled after a time without very serious damage resulting. The cervix is first to be thoroughly cleaned, and may be slightly scarified to draw a few drops of blood. Three or four leeches should then be placed in the speculum, its lower extremity closed by a plug of cotton-wool, and the speculum watched till the leeches have ceased sucking. The whole process is generally completed within half an hour. Single leeches may also be applied by a long glass tube provided with a piston, or by leech forceps. In case of excessive bleeding after removal of the leeches, a plug of cotton-wool soaked in perchloride of iron may be applied to the cervix, or each leech-bite may be touched with the point of a heated knitting-needle.

Local depletion may be performed in the consulting-room or hospital out-patient room, but it is preferable that the patient should remain at rest in bed for some hours afterwards, especially if leeches are used. Several repetitions of puncturing or leeching are generally required at intervals of ten days or a fortnight. Neither should be performed within five or six days before a menstrual period is due; otherwise its recurrence is apt to be interfered with. If, however, menstruation is scanty, and an increase of congestive pain occurs at its cessation depletion immediately after the flow often gives relief.

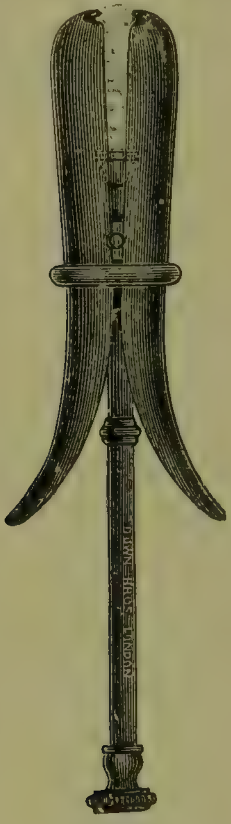

Fig. 102.
Barnes' Tampon Introducer.

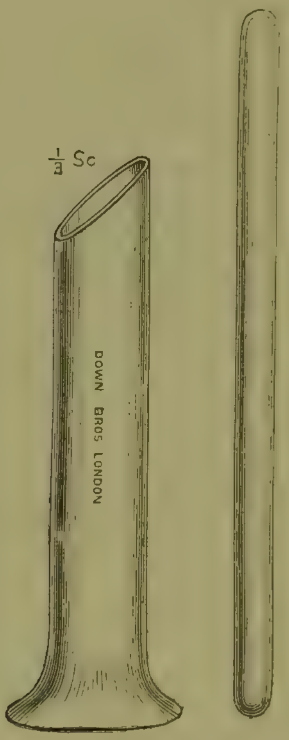

Fig. 103.
Aveling's Tampon Introducer.

A very convenient mode of causing a flow of copious secretion from the cervix and vagina, and so depleting their vessels, is the use of strong glycerine, by which the need for withdrawing blood may often be avoided. A tampon of cotton-wool is to be thoroughly soaked in from half an ounce to an ounce of glycerine, and passed up to the cervix, a string or thread being tied round it to facilitate removal. It should be left twelve or twenty-four hours. In the case of erosion or endometritis, an astringent may be dissolved in the glycerine, but the pure glycerine produces the most copious flow. It is often used with advantage after puncturing or leeching. The glycerine in stimulating secretion acts by its attraction for water. It has been shown from observations by Dr. Herman that, as might be anticipated, it is most effective in this respect when little or no leucorrhœa existed previously; and that, where there was an abundant leucorrhœa, it has scarcely any effect.

The patient may generally introduce the tampon herself, by means of Barnes' tampon introducer (Fig. 102), and sometimes even without such assistance. In the latter case, however, a good deal of the glycerine is apt to be squeezed out in passing through the vulva. The glycerine may be solidified by combination with gelatine, and introduced in the form of suppositories containing each from ʒij. to ʒiv. These are useful if a patient finds a difficulty in managing the glycerine plugs.

Another form of tampon introducer (Fig. 103) resembles a small Fergusson's speculum, and the tampon is passed up through it by means of the piston.

PASSIVE HYPERÆMIA OF THE UTERUS.

Passive hyperæmia may be by itself a cause of subinvolution and hyperplasia, but is more frequently associated with active hyperæmia or inflammation, and tends to aggravate their effects. All displacements of the uterus which put a strain upon the broad ligaments tend more or less to interfere with the return of the venous blood from that organ. Those which have the most powerful influence are prolapse of the second or third degree with strangulation, and acquired retroflexion, which causes the veins to be compressed against the utero-sacral ligaments, as well as from the effect of the descent of the fundus uteri itself. Passive hyperæmia is also produced by general causes of venous obstruction in the heart or lungs, and by any local pressure on the veins by ovarian or other tumours, ascites, or fæcal accumulations, and is promoted by want of exercise or constipation. Obstruction to the portal circulation, such as is produced by cirrhosis of the liver, may lead to congestion of the uterus more indirectly, owing to the communications existing between hæmorrhoidal veins and those of the broad ligament. Any fixation of the uterus also tends to passive hyperæmia by interfering with the freedom of its motions, and, in most instances, leads to its enlargement. Such cases are frequently complicated by the effects of inflammation, but hyperplasia is brought about through fixation of the uterus even by a peritonitis which did not originate in the pelvis. Passive hyperæmia is apt to be promoted, in all classes of society, as the effect of posture: in the labouring classes by prolonged standing, with which is often associated a greater or less degree of prolapse of the pelvic viscera; amongst the wealthy, by the excessive use of the dorsal reclining position in cushioned chairs or sofas, as opposed to the recumbent posture, and by the use of feather-beds instead of firm mattresses. In the dorsal reclining position, the pelvic brim is rendered nearly horizontal, instead of being inclined about 55° to the horizon, as it should be in the upright position. The pelvis is thus exposed to the full weight of the abdominal viscera, and the return of venous blood from it is at the greatest disadvantage, while any tendency to retroversion or retroflexion is promoted by gravity. At the same time the use of soft cushions obviates the natural tendency which persons resting in a harder seat have to change their position frequently, and so assist, in an important degree, the venous circulation. In lying on a feather-bed, also, the pelvis sinks in and becomes the lowest part of the body, whereas, upon a harder couch, in consequence of the greater width of the hips, the pelvis is somewhat higher than the shoulders.

The relation of passive hyperæmia to inflammation is that it does not, by itself, tend to produce inflammation, although it may lead to hypertrophy, and even to associated degeneration, but that it renders the tissue vulnerable to slight causes of inflammation, and makes the inflammation more obstinate when once excited, and repair more tardy. An example of this may be found in the case of ulceration of the legs, associated with varicose veins, and the same principle is largely exemplified in the case of the uterus.

Treatment.—The first indication is to remove, if possible, all direct causes of venous obstruction, general or local, and especially to cure retroflexion or prolapse. Regulation of the bowels is of the utmost importance, and the practice of at least a daily evacuation at a regular time must be enforced, much trouble often arising from mere carelessness in this respect. The greatest relief is afforded by saline aperients, such as sulphate of magnesia and sulphate of soda, and a convenient mode of giving these drugs is in the form of one of the mineral waters, as Franz Josef, Hunyádi Janos, Friedrichshall, Æsculap, or Pullna, to be taken the first thing in the morning with an equal quantity of hot water. When hyperæmia of uterus or ovaries is associated with much pelvic pain or tenderness, it is often desirable to secure a somewhat liquid motion at least twice a day, evening as well as morning, so as to diminish as much as possible the venous pressure during the hours of sleep. For this purpose drachm doses of sulphate of magnesia may be given two or three times a day.

In all cases of passive hyperæmia, postural treatment should receive due attention, since the blood-pressure in the pelvis is necessarily increased in the upright position, and the ratio of increase, compared with the total pressure, is much greater in the veins than in the arteries. Long standing or sitting should be avoided, as well as the undue use of the dorsal reclining position on cushioned chairs, and the use of soft feather-beds. Rest on a flat couch or bed in the lateral or semi-prone, rather than the dorsal, position should be frequently taken.

Passive hyperæmia receives benefit from all external agencies which act as stimulants to the general circulation, and especially to the heart. Of these some form of cold bath, the most generally useful being the hip-bath, taken on rising in the morning, is the most powerful, and in combination with this the cold vaginal douche, administered by Higginson's syringe, often proves a valuable adjuvant, provided that no active inflammatory state of pelvic organs be present. Failing the vaginal douche, the bath speculum, a small tube with perforations, may be used by the patient. In winter the water may be warmed to about 60° or 65° F. If neither cold douche, hip, nor sponging bath can be borne, alternate sponging with hot and cold water is a milder stimulant. If there is any weakness of the heart's action, the administration of digitalis helps to diminish general venous pressure, and a suitably nourishing diet and general tonics tend to the same effect. The veins of the uterus are emptied by the influence of ergot and other drugs causing contraction of the uterine walls, though these act more especially upon the arterial supply. The use of local depletion has been already mentioned (p. 164.)

INFLAMMATION OF THE UTERUS.

Inflammation of the parenchyma of the uterus is termed metritis; inflammation of its lining mucous membrane, endometritis. In the most acute forms of inflammation all the tissues of the organ take part, and body and cervix are usually involved together, the affection of the body being the most important. Acute endometritis and acute metritis will therefore be considered together as a whole. Chronic endometritis, or metritis, may affect either the cervix alone, the cervix and body together—in which case the disease of the body is the more important—or, in rarer instances, the body alone. It has already been described how, even in chronic affections, the inflammation is never entirely confined to the mucous membrane, but extends, in greater or less degree, to the adjoining parenchyma (*see* p. 162). Inflammation of the mucous membrane of the cervix, or cervical endometritis, will therefore be described in connection with inflammation of the substance of the cervix; that of the mucous membrane of the body, or corporeal endometritis, in connection with chronic metritis.

ACUTE METRITIS AND ACUTE ENDOMETRITIS.

Acute inflammation of the whole uterus is generally microbic in origin. The most severe form of it is that which arises from infection through the introduction of septic microbes after delivery or abortion, or after operations upon the uterus, the use of tents, evacuation of retained menstrual fluid, the wearing intra-uterine stem pessaries, the use of unclean instruments for procuring abortion, or simply the introduction of a sound, whether the sound itself is non-sterilized, or carries up infective material from the vagina.

Less severe and more limited forms of inflammation may be simply traumatic, after severe operations on the uterus, such as enucleation of a fibroid, intra-uterine injections, introduction or applications of caustic solids or liquids to the fundus or cervix, or wearing of stem pessaries. In these, if marked pyrexia occurs, or the inflammation proves to be spreading in character, it may be inferred that some microbic infection has taken place in addition.

In the vagina a great variety of saprophytic microbes, both bacilli and cocci, are normally present. To a special form of bacillus, the bacillus of Döderlein, the normal acid reaction of the vaginal secretion is ascribed. According to most authorities, none of the pathogenic micrococci of suppuration are normally present, the acid character of the secretion being adverse to their growth. In the presence, however, of very numerous microbes, it is difficult to be certain of the absence of any one, or to be sure whether saprophytic microbes, such as non-pathogenic streptococci, may not, under certain circumstances, such as traumatism, acquire a pathogenic character. The question is not, therefore, absolutely settled whether septic infection necessarily implies the fresh introduction of septic microbes into the vagina from without. It is pretty certain, however, that the more virulent varieties of microbes are so introduced. In chronic infection by gonococci, it appears that other cocci of suppuration may also be present, and thus lead to mixed infections.

Most authorities also agree that the secretion of the fundus uteri is normally free from microbes, and also that of the cervix, above the level at which it is freely open to the vagina. This in the normal nulliparous uterus coincides with the external os, or a point very little above it. In the parous uterus, when the cervix is patent, especially when it has been irregularly lacerated, it is higher up. The uterine mucus has, therefore, probably normally a bactericidal action, which is aided by the downward current in the secretion, produced by the contractions of the uterus, and ciliary action in the endometrium of the fundus.

The reports of bacteriological observers who have made cultivations do not, however, by any means agree. Winter, working on uteri obtained by extirpation, concluded that the healthy uterine cavity contains no micro-organisms, but that the cervical secretion of every healthy woman contains numerous bacteria, and in pregnancy the bacteria, especially the bacilli, increase to a large extent. Brandt found, in 22 out of 25 cases, bacteria in the cavity of the uterus, and pathogenic organisms in 31 per cent. of cases of endometritis. Solowieff examined women suffering from gonorrhœa or tuberculous disease, and found micro-organisms in the cervix in 39 out of 45 women examined. In 7 cases he found streptococci and staphylococci. Gottschalk and Immerwahr examined 60 cases, and found bacteria, including *Staphylococcus pyogenes*, in the uterine canal in 65 per cent. They concluded that there was a secondary invasion of the endometrium by the staphylococcus in connection with a gonorrhœal infection which had run its course or become chronic. Laplace* of Philadelphia, from experiments in Koch's laboratory, concluded that the normal endometrium of uterus and cervix is a harbour for vast numbers of micro-organisms, some of which possess poisonous qualities for guinea-pigs, and that in chronic endometritis the streptococcus and *Staphylococcus pyogenes aureus*, *albus*, and *citreus* are found in the secretions, and also in the epithelium and fibrous tissue. It may be concluded that, although the vagina and cervix may be free normally from septic organisms, they cannot be relied upon as being so in any given case, especially in married women, of whom it is generally impossible to be certain that they may not at some time have had gonorrhœa.

Next to septic endometritis the most acute form is that due to gonorrhœa. The chief site of gonorrhœal inflammation in the adult is the vulva, specially the urethra and the vulvo-vaginal glands, and the cervix uteri. The vagina suffers comparatively little, although gonococci may be found in it. From the cervix, gonococci are apt to spread to the body of the uterus, and along the Fallopian tubes to the peritoneum, where they set up perimetritis. The gonococci have a greater power than any other microbe of spreading into and multiplying in the uterine secretion, and it is probable that infection of the cervix uteri is in many cases primary. From the influence of the gonococcus other pus microbes may find a lodgment in the uterus, and lead to a mixed infection.

Severe forms of endometritis are sometimes produced, especially in children, by the specific fevers, such as scarlatina, measles, enteric fever, and pneumonia; and sometimes adhesions have resulted, with occlusion of the genital canal. More often the mucous membrane is infiltrated with blood, and more or less disintegrated, and a sanguineous discharge is produced. It is not known how far the inflammation is due directly to the microbe of the disease or its toxin.

Subacute forms of endometritis are attributed to the effect of cold, especially cold taken at a menstrual period and leading to its suppression. Little is known of their bacteriology, but it may be presumed that the effect of cold may render the uterus vulnerable to kinds of microbe often present in the vagina, and generally only saprophytic, just as a tonsillitis due to exposure to cold may depend upon one or other of several kinds of microbe commonly present in the mouth. In one case of an acute muco-purulent discharge coming from the os uteri in a virgin, and so severe as to suggest a suspicion of gonorrhœa, I had the secretion examined, and found it to be a pure culture of the influenza bacillus, although the patient had suffered from no pyrexia or pulmonary catarrh. Since many, if not most of, infectious colds are probably degenerated influenzas, such an origin of a uterine catarrh may be not uncommon.

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* "Amer. Journ. of Med. Science," Oct., 1892.

Tubercular infection may lead to ulceration of the endometrium and purulent discharge from it, but this subject will be considered hereafter.

Pathological Anatomy.—Acute metritis is always complicated by endometritis, and in the more severe forms the inflammation extends to the peritoneal surface of the uterus, which becomes covered with lymph, to the Fallopian tubes, and sometimes also, especially in the septic variety, to the neighbouring cellular tissue. The uterus becomes hyperæmic and enlarged by infiltration of serum, while, in the most acute form of inflammation, ecchymoses are scattered through its substance. In the septic variety, small collections of pus may be found between the muscular fibres, in the veins or lymphatics of the uterus, or still more frequently in those of the broad ligament adjoining. Purulent peritonitis may also be set up, and in cases dependent upon lymphatic absorption the affection of the peritoneum often preponderates over that of the uterus itself. Acute abscesses of notable size in the uterine wall have occasionally been recorded, but are very rare. Much more frequent are abscesses in the ovaries, or cellular tissue of the broad ligament. The disease may also end in acute or chronic pyæmia. In acute gonorrhœal endometritis the muscular wall is not affected so deeply or so severely, but the whole uterus is swollen, tender, and painful. The secretion, normally clear mucus, becomes muco-purulent or purulent, often tinged with blood. The disease does not tend to spread to the cellular tissue, but along the Fallopian tubes to the peritoneum. If the fimbriated extremity of the tube becomes quickly closed by adhesion, pyosalpinx may result, or hydrosalpinx in milder forms of inflammation, without any extensive affection of the peritoneum. If it remains open longer, a more considerable peritonitis is the result. This is, in most cases, adhesive, and limited, but in rare instances it may be purulent and widespread or general.

Even in forms of endometritis attributed to cold, and occurring in women in whom there is proof of virginity, and no evidence of tubercle, the inflammation may be severe enough to lead to a purulent discharge and set up salpingitis and perimetritis. Probably it may be associated with pus microbes having only a moderate degree of virulence.

As regards the condition of the mucous membrane, the inflammation affects both the stroma and the glandular epithelium, but the former in the most marked degree. On a section the capillaries may be seen distended, the cells of the stroma separated by effusion, blood effused amongst them, and an excess of round cells of an inflammatory character. The section, of which a micro-photograph is shown in Fig. 104, was taken from a case of subacute endometritis, not septic or gonorrhœal, in which the uterus was removed by operation, not at the time of a menstrual period. The cells are separated by inflammatory effusion; blood cells and inflammatory cells are infiltrated amongst them; the free surface is partially disintegrated and its epithelium lost. In this case the gland epithelium is comparatively unaffected; but in more acute inflammation the epithelium loses its regularity, and the gland cavities are filled with irregular cells. Inflammatory cells are also infiltrated in the muscular layer, especially in the neighbourhood of the mucous membrane.

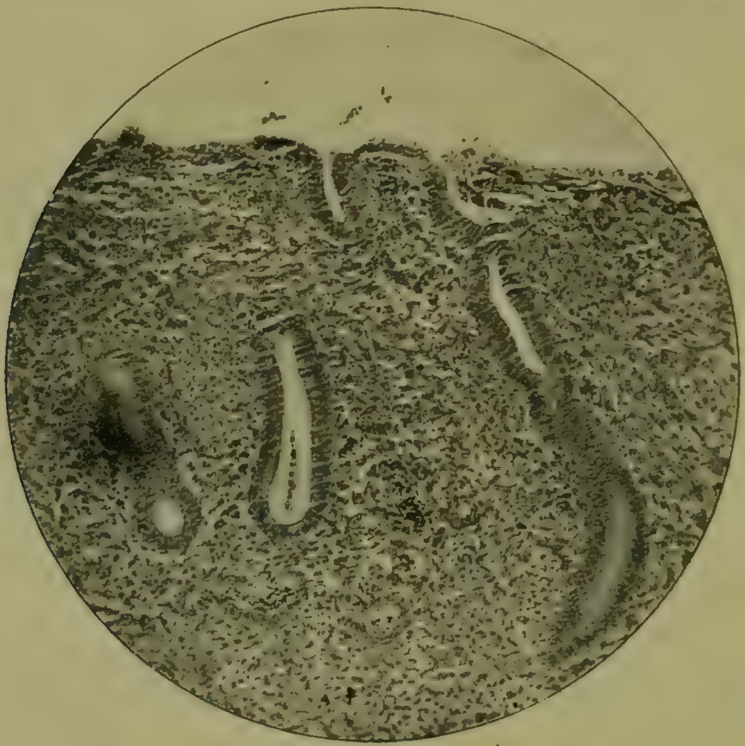

Fig. 104.
Subacute Endometritis.
Micro-photograph by Dr. E. S. Worrall.

Results and Symptoms.—In most cases of severe septic or traumatic metritis, while the uterus itself is found to be swollen and excessively tender, the symptoms of peri-uterine inflammation, especially of that of the peritoneum, preponderate over those of the metritis proper. Both septic and traumatic forms are marked by rigors and considerable elevation of temperature. In the septic variety the increase in pulse-rate is often more marked than that of temperature, and as the disease advances the pulse, while becoming small, becomes at the same time compressible. In bad cases, in which the peritoneum is extensively affected, the abdomen quickly becomes tympanitic, and the breath acquires the peculiar sweetish odour of septicæmia.

In acute endometritis, with more or less participation of the uterine walls in the inflammation, but without any peri-uterine complication, the symptoms are pain, with a sense of weight and heat or throbbing in the pelvis, and pain also in the back, groins, and thighs. Considerable febrile action is present in the more severe cases. The pain is much aggravated by movement, or by any bearing-down effort; there is often much vesical tenesmus, and the urine is generally high coloured. There may be paroxysmal aggravations of pain due to uterine contractions, and marked by their intermittent character. Occasionally there is active diarrhœa for a time, set up by reflex irritation, though, with the exception of these attacks, the bowels are generally constipated. When severe endometritis or metritis arises during menstruation, its immediate effect is usually the arrest of the flow. Septic metritis has a similar effect upon the lochial discharge, or that which follows abortion. In traumatic endometritis, however, especially when induced by caustic applications such as the insertion of the solid nitrate of silver into the uterine cavity, there may be profuse sanguineous discharge in the early stage. Thus, effusion of blood, or increase of the natural flow, generally indicates an early stage or a moderate degree of inflammation. Severe endometritis when established, especially when septic, suppresses the natural flow, probably in consequence of compression of the vessels by the effusion of inflammatory cells. Ordinarily, at the outset of acute endometritis the discharge is scanty and serous; after a few days it becomes profuse and muco-purulent, often offensive to the smell, and sometimes tinged with blood. Usually it has an irritating effect upon the vagina and vulva, and may cause excoriation of the thighs.

In septic metritis the prognosis is always grave, and bad cases pass rapidly into purulent peritonitis and end fatally in spite of all treatment. Simple acute endometritis and metritis are apt to merge into the chronic form of the disease, and relapses are specially likely to occur at ensuing menstrual periods.

Diagnosis. — Endometritis and metritis uncomplicated by peri-uterine inflammation are distinguished by the mobility of the uterus, and the absence of any thickening round it. Constitutional disturbance is less than in pelvic peritonitis or cellulitis, but greater than in simple vaginal inflammation. On vaginal examination, the cervix is found swollen and sensitive, its arteries often pulsating strongly, and the os patulous. On bimanual examination, the body of the uterus is found to be very tender on pressure, and still more so if movement be imparted to it. It is often distinctly enlarged, and, if its previous size be known, the degree of swelling indicates the extent to which the uterine parenchyma has taken part in the inflammation. If the speculum be used, the cervix is seen to look red and œdematous, and to contain shreds of mucus, scanty serous fluid, or muco-pus. As a rule, the sound should not be used. If employed it causes great pain, and generally some bleeding.

To determine the species of microbe responsible for the inflammation, secretion should be obtained from within the cervix by a sterilized swab, before antiseptic douches have been used, and tested both by immediate microscopic examination and by cultivation.

Besides gonococci, streptococci, and staphylococci, I have found purulent discharge from the cervix associated with the presence of peculiar forms of bacilli, not easily recognized as known species. These are probably saprophytes, which, under peculiar circumstances, have become pathogenic. A case of inflammation dependent on the influenza bacillus has already been mentioned.

Diagnosis of Gonorrhœa.—The diagnosis of gonorrhœa must be made from the history and general aspect of the case as well as from the condition of the uterus. A history of probable causation will often be wanting, but it may sometimes be ascertained that the husband has suffered from a urethral discharge, or has been affected by the wife. The onset will have been sudden, and generally accompanied by scalding on micturition and soreness at the vulva. In the acute stage the discharge is purulent, yellowish or greenish, and may be offensive. It may be possible to squeeze a drop of pus from the urethra or the ducts of the vulvo-vaginal glands. In any case the vulva and urethra are more affected than the vagina, and the orifices of the ducts of the vulvo-vaginal glands may be seen to be intensely red.

The diagnosis may be confirmed by the discovery of the gonococcus in the acute stage; but in the chronic stage, when there are many microbes mixed, this is more difficult. A drop of pus or secretion is obtained from the urethra, or vulvo-vaginal duct, or, failing these, from the cervix, and smeared over two cover-glasses by pressing them together. These, after separation, are dried simply in the air, covered from dust, or may be dried over the flame of a spirit lamp, held in the fingers, not by forceps, so that they may not be overheated.

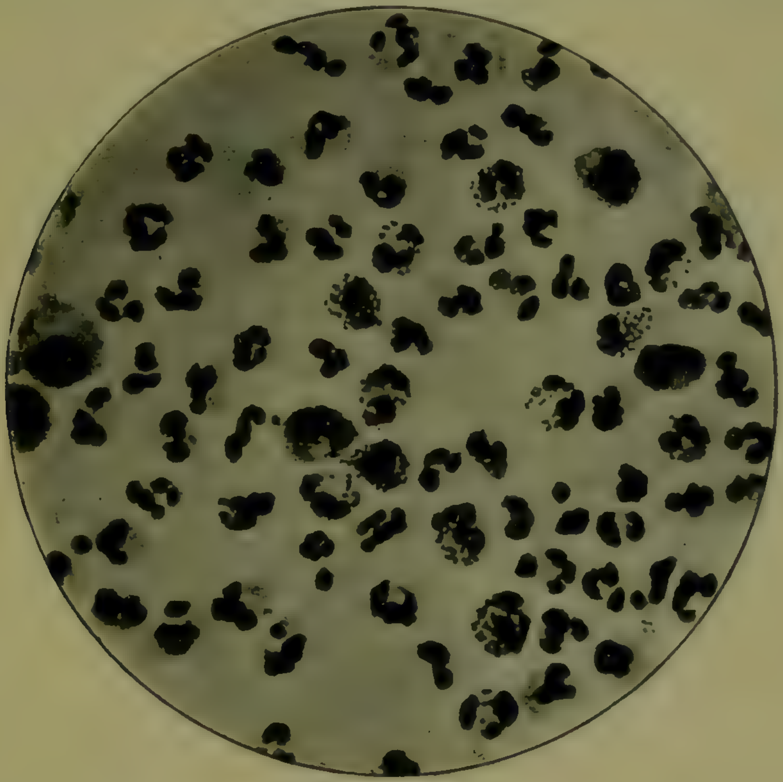

Fig. 105
Gonococci in Pus from Vagina.
Micro-photograph by Dr. G. L. Eastes. × 1,000.

The two cover-glasses are then stained in different ways: one by a simple aniline stain such as a saturated watery solution of methyl violet. A few drops of the solution are poured over the cover-glass, or the glass is inverted for a minute on the surface of the staining solution contained in a watch-glass, and then the excess of the stain is washed off. After drying, the specimen is mounted in Canada balsam. In this any gonococci present will be stained.

The other cover-glass should be stained by Gram's method.* In this other micro-organisms will be stained, but the gonococci will be decolorized. Some prefer to use fuchsin or some other dye of a different colour afterwards as a double stain, to make the microbes visible which are decolorised by Gram's method.

The gonococcus, first described by Neisser, is generally seen in the form of a diplococcus, sometimes in a group of four, from its dividing alternately in two planes at right angles, sometimes singly, but it never forms chains. The pairs of cocci resemble two small thick buns with their flat sides apposed and very slightly separated. An oil immersion $\frac{1}{12}$-in. objective is required to see them well. The greatest diameter of the coccus varies from ·8 to 1·2 μ. The special characteristic that they are decolorized

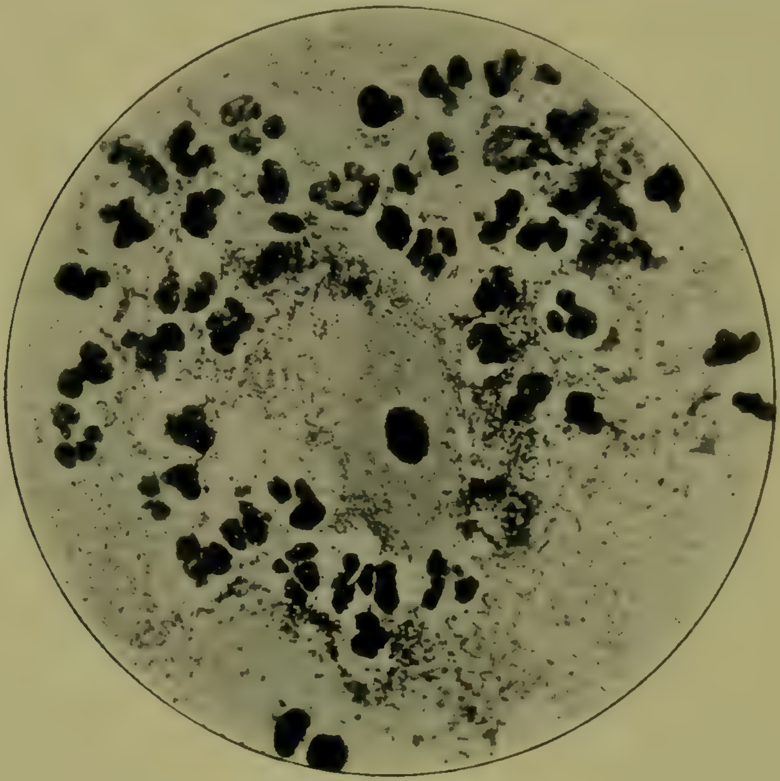

Fig. 106.
Mixed Microbic Infection in Pus from Vagina.
Micro-photograph by Dr. G. L. Eastes. × 1,000.

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* Place the cover-glass from two to three minutes in a solution of gentian violet, prepared according to the following formula:—To 10 c.c. of water add 2 c.c. aniline oil, shake well, and filter through moist filter paper. To the clear aniline water obtained add 1 c.c. of 97 per cent. alcohol and 1 c.c. of a saturated alcoholic solution of gentian violet. The excess of fluid is drained off from the cover-glass with filtering paper. Next the cover-glass is placed for five minutes in Gram's iodine solution, which consists of iodine, 1 part; potassium iodide, 2; water, 300; and then placed directly into alcohol, 97 per cent., in order to wash out all the colouring matter.

by Gram's method does not distinguish them from all other microbes, but it is believed to do so from those which are liable to be mistaken for them. Another distinctive characteristic is that they are seen specially in or upon the surface of the pus cells, while other microbes abound most in the intervening fluid.

In Fig. 105, p. 177, is shown a micro-photograph of gonococci from vaginal pus, in which this characteristic is well marked. The observer must not expect to see the diplococcus form in every microbe, nor as plainly as it is shown in diagrammatic drawings. On the other hand, the shape can, of course, be seen better in the slide, by the aid of focussing, than it can be shown in a photograph.

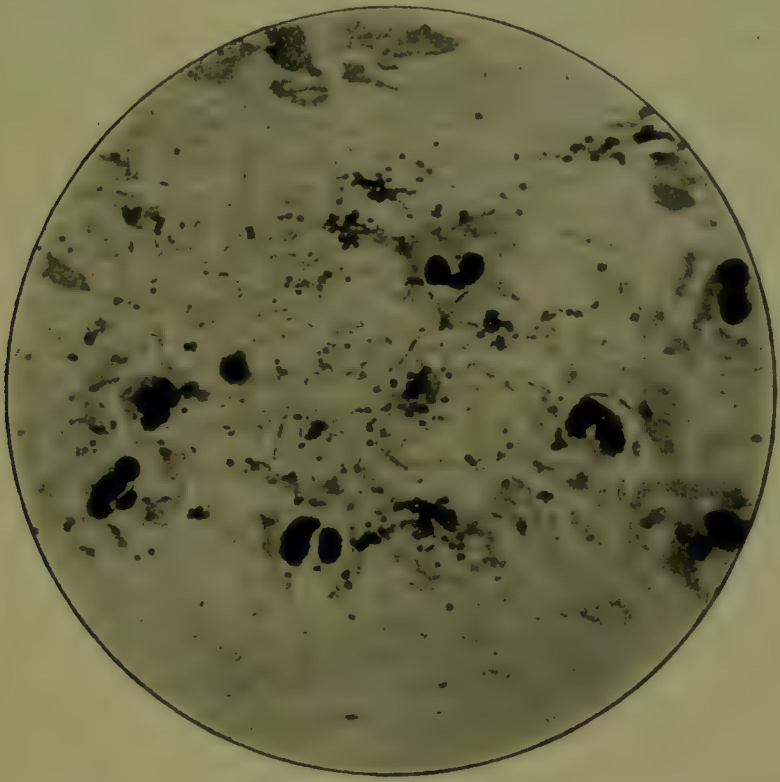

Fig. 107.
Diplococcus somewhat resembling Gonococcus in Pus from Vagina.
Micro-photograph by Dr. G. L. Eastes. × 1,000.

Two other photographs are added for comparison. In Fig. 106 is shown a mixed infection of microbes, many of them bacilli, in vaginal pus. It will be seen that they are not clustered about the pus cells, but abound most in the intervening fluid.

In Fig. 107 is shown a diplococcus in vaginal pus, somewhat resembling the gonococcus, as it is arranged sometimes in pairs, sometimes in fours. The distinctions are that it is more irregular in size, and mostly larger than the gonococcus, and that it is not specially attached to the pus cells. But the most decisive difference was that it was not decolorized by Gram's method.

Since the determination, microscopically, of gonococci is not always easy to the inexperienced, the best plan in practice is, having obtained the smears on cover-glasses, to send them to a bacteriological expert for staining and report.

Husbands not infrequently complain that urethritis has been produced by coitus, when no sign of the gonococcus can be discovered in the secretion, and when it appears to be certain that the wife has not been exposed to any venereal infection. It appears to be clear that other microbes, cocci or perhaps bacilli, which may be associated with vaginal or uterine inflammation, are capable sometimes of causing infection, especially if the husband has any predisposition to urethritis, such as that due to a gouty temperament. The inflammation so produced is generally much milder than gonorrhœa, and of shorter duration.

Cultivation of the gonococcus is so difficult that this method is not often practically available for diagnosis. It does not grow on ordinary culture media, and it readily dies on being cooled to the ordinary temperature of the air. Success of a culture cannot, therefore, be relied upon, unless the specimen can be at once transferred to the incubator, or in some way kept warm meantime.

The gonococcus grows best in a mixture of human mucus with urine, two parts to one. The fluid from an ovarian cyst, which is a kind of mucus, answers well, but naturally this is usually not available. Wertheim's method is to mix gonorrhœal pus with uncoagulated human blood serum, and add the mixture to one or two parts of melted agar at about 40° or 45° C. This mixture is then allowed to solidify in an oblique position in the tube.

Young and Hagner's method is as follows:—Collect acid urine containing 5 per cent. or more of albumen, allowing it to decompose. Boil the urine till the albumen is precipitated, then filter. Boil the urine again, and add 1·8 per cent. agar, 0·3 per cent. beef extract, 0·5 per cent. sodium chloride, and 1 per cent. peptone; render neutral or slightly acid, and, after cooling to 60° C. (140° F.), clear up with one or two eggs. When the medium is ready for use, it is clear, neutral or slightly alkaline, and may be treated as ordinary agar, in a slanted tube, or for a plate culture.

In cases of mixed infection, in which other microbes abound which grow more freely outside the body than the gonococcus, it is only by a plate culture that growth of the gonococcus can be expected to be detected.

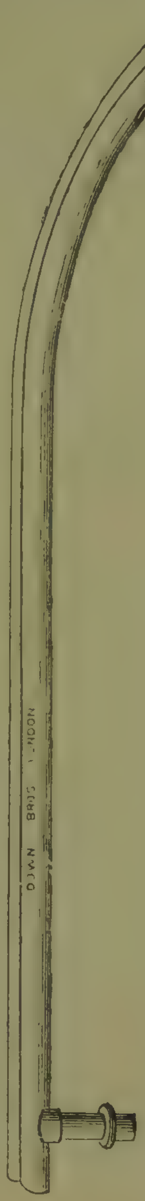

Fig. 108.—Budin's Double-action Catheter

Treatment.—In *septic metritis* the first indication for treatment is to get rid of the exciting cause. Any retained placenta, or clot, or decomposed polypus or other tumour, should be, if possible, evacuated at the very commencement of symptoms. When the inflammation is fully established, and the os does not admit the finger, especially if the inflammation has extended beyond the uterus to cellular tissue or peritoneum, it may be a difficult question whether artificial dilatation of the cervix is desirable. When, however, the discharge has any considerable fœtor, and it is suspected that there is something in the uterus, it is better to run the risk of interfering, and in any case it is advisable to explore the uterus, if there is an opportunity of doing so, at an early stage in the inflammation. It is preferable, if possible, to introduce the finger, with the aid of an anæsthetic, or to effect rapid dilatation of the cervical canal by a two-bladed, or three-bladed, dilator, such as that of Goodell or Bossi (Figs. 50, p. 61, and 51, p. 62), or by Hegar's dilators (Fig. 46, p. 58), and avoid the use of tents. If tents are used, care should be taken to dilate the cervix by a single application, and not to leave them longer in place than necessary.

After dilatation of the cervical canal, the cavity of the uterus should be thoroughly evacuated. First, the vagina should be cleansed and washed out with an effective antiseptic solution, such as iodide or perchloride of mercury, 1 in 2,000. Next, the uterine cavity is also to be washed out. The best tube for the purpose is Budin's double-action catheter (Fig. 108). A transverse section of this catheter is shaped like a horseshoe. A groove is thus formed on the outside of the tube, which serves for the return current, and is not liable to be blocked by clots or shreds, as are the openings into the return tubes of the ordinary double-action catheters.

Budin's catheters are made of various sizes, and of celluloid, glass, or metal. The two latter can best be sterilized by boiling. With a large uterus the glass catheters may be used; but with a small one, as after an early abortion, the metal tube is preferable, since in the glass instrument the groove on the outside cannot be made so deep in proportion to the size of the instrument, and does not therefore, in a small catheter, allow so free a return. Metal tubes can be used with iodide of mercury with less damage than they suffer from the perchloride.

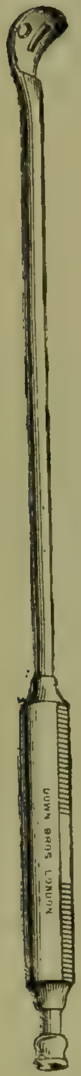

Fig. 109.—Irrigating Curette.

To supply the fluid the best apparatus is an irrigator acting by hydrostatic pressure, attached by a long flexible tube to the catheter. The tube and catheter should be completely filled before introduction of the tube, and the stopcock just above the catheter then turned, or a spring clip placed upon the tube in a similar position, in order to retain the fluid, before the tube is passed up into the uterus. In the absence of an irrigator or funnel, a simple syringe, large enough to hold ten ounces or more, is preferable to Higginson's syringe, since, with the latter, injection of air together with the fluid can hardly be avoided. It does not, however, give the security against undue pressure which is afforded by the hydrostatic method. In the absence of a special tube, a large gum-elastic catheter may be used, provided that it does not fit tightly in the cervix.

Any placental tissue or other septic material contained in the uterus can generally be evacuated by the pulp of the finger, in the manner described at pp. 154, 155. If there is any difficulty about detaching the whole of it, the curette should be used. For this purpose, if the uterine cavity and canal are not too small, the irrigating curette (Fig. 109) is convenient; and by its means a constant stream of antiseptic fluid can be kept up while the uterus is scraped, the curette being connected to an irrigator by a rubber tube.

After evacuation of the uterus it is advisable to pack it with antiseptic gauze to keep up an antiseptic influence on the endometrium. The moist 10 per cent. iodoform gauze, kept sterilized in sealed bottles, answers well for this purpose. In its absence, ordinary iodoform or cyanide of mercury gauze, soaked in formalin solution, 1 in 500, may be used. A strip is prepared of suitable size, the cervix is exposed with a Sims' speculum, and the strip passed up to the fundus with long forceps so as to pack the uterus from above downward, care being taken to fill both corners of the fundus. A light plug of similar gauze is placed in the vagina. If the condition improves, the gauze plug may be left two or three days *in situ*. If pyrexia continues, it may be changed at twenty-four hour intervals, and the uterus washed out at each occasion. The dressing is changed by the aid of Sims' speculum, but an anæsthetic is not required.

The curette may be used for two different purposes, either to evacuate necrotic material, as described above, or with the intention of removing the whole of the endometrium which has become infiltrated with septic microbes. For the latter purpose, the curette must be a sharp steel one, and must be used very thoroughly over the whole of the uterine cavity. After the curetting the uterus is packed with iodoform gauze in the manner already described. Some authorities, especially some American authorities, recommend this procedure in all cases of septic endometritis, and extend the recommendation even to cases in which the inflammation has spread beyond the uterus, and cellulitis, pyosalpinx, or peritonitis has resulted.

On the other hand, it is urged that it is very improbable that the whole of the infiltrating microbes can be reached and removed, and that the curetting breaks down the barriers which cell infiltration has formed against them, and so may allow fresh absorption, while by its traumatic effect it increases inflammation.

In the case of the puerperal uterus, experience seems to show that curetting, as a routine practice, is not advisable, and rather tends to increase than diminish the mortality of septic endometritis. In a small uterus, after abortion, the risk of curetting is less, the surface affected being smaller. If the curette has to be used in any case to complete the removal of necrotic tissue, the curetting may be extended to the whole uterus. The cases most suitable to this treatment are those in which the septic inflammation is recent, so that it has not extended beyond the uterus, and especially those in which it is limited to the endometrium, and has not yet penetrated the muscular wall.

In the constitutional treatment of severe septic infection, the best chance appears to lie in the subcutaneous injection of antistreptococcic serum. This should be undertaken without waiting for evidence of the nature of the microbes concerned, since, in fatal cases, streptococci are generally found, though the infection may be a mixed one. The secretion from within the cervix should, however, in all cases be examined, and if streptococci are found in it, or cultivated from it, it is an indication for perseverance with the serum.

It is well to begin by injecting 20 c.c. (or two bottles) of the serum, and to repeat this, in severe cases, at least twice a day. The injection should be made at some part not subject to pressure, as at the upper part of the abdomen, and the site of injection should be varied. If syringe and skin be carefully sterilized, the serum appears to cause no ill effects except a little redness and swelling at the site of injection, and sometimes a very irritable rash after a few days, occasionally with pains in the joints. If the infection is not due to streptococci, but to staphylococci or other microbes, the serum cannot, of course, be expected to have any beneficial effect. Moreover, the same serum is not equally effective for all varieties of streptococci. If, therefore, the serum appears to have little effect, it is advisable to try one of a different origin. In puerperal cases, a serum derived from the toxin of puerperal septicæmia itself or from erysipelas is most likely to be effective, puerperal septicæmia being more closely allied to erysipelas than to ordinary surgical or accidental septicæmia. The same probably holds true of septicæmia following abortion.

Before the introduction of anti-streptococcic serum, large doses of quinine were chiefly relied upon for the treatment of severe septic infection. These may still be used in the absence of, or in addition to, the anti-streptococcic serum. But such drugs are of less importance than to maintain the strength with nutritious liquid food, and a free administration of stimulants. If the quinine, therefore, causes vomiting or nausea, it should not be persevered with.

If quinine is given, it is well to begin with 30 grains given in two or three doses at short intervals, until the temperature is markedly influenced, or cinchonism produced. If vomiting interferes with the retention of the quinine, it may be given in the solid form, combined with a full dose of subnitrate of bismuth in a mucilaginous mixture, or a smaller dose may be given subcutaneously, the kinate of quinine* being the best form for this purpose. Opium, or morphia, must be given in sufficient quantity to allay the pain. Locally, fomentations or turpentine stupes assist towards this object. Other internal antiseptics, such as sulphite or sulpho-carbolate or salicylate of soda, have scarcely shown themselves to be equal in value to quinine. In highly adynamic states, however, Warburg's tincture, containing quinine with a great variety of other substances, among which are aromatic stimulants, has sometimes been found more serviceable than quinine alone. Two successive doses of half an ounce, undiluted, may be given at two or three hours' interval, brandy or beef-tea only being taken meanwhile. In a similar adynamic state, with much tympanites, turpentine, in doses of 15 or 20 minims, may be useful as a stimulant.

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* See a paper by Mr. Collier in the "Pharm. Journ.," Sept., 1878. Hypodermic tablets, containing carbamide of quinine, are also prepared by Messrs. Burroughs and Co. These are sufficiently soluble to allow a considerable dose to be used subcutaneously, as are those of quinia and urea hydrochloride prepared by Messrs. Parke, Davis, and Co.

If high temperature persist, it should be reduced by direct application of cold. For this purpose the most convenient means is Thornton's ice-water cap, or Leiter's temperature regulator, made in the form of a cap, whereby a continuous stream of ice-cold water is made to circulate round the head. Another method is to place the patient upon a water-bed, from which water is from time to time drawn off, and cold water added.

It is of the highest importance to support the strength by administering such nourishment as milk, beef-tea, and eggs, at short intervals, as well as stimulants in ample quantities. If food is rejected by vomiting, recourse should be had at once to nutrient enemata. For this purpose "Derby and Gosden's fluid meat" (sold by Messrs. Savory and Moore, 143, New Bond Street), or Benger's peptonized beef jelly, is of great value. A fluid which undergoes artificial digestion in the rectum may be made by mixing thick boiling gruel with an equal part of cold milk, and adding to four ounces of the mixture a drachm of Savory and Moore's saline essence of pancreatine, or Benger's liquor pancreaticus, and five grains of bicarbonate of soda. Instead of the liquid preparations of pancreatine, Burroughs' or Fairchild's peptonizing powders may be used. If these nutritive fluids are not retained, solid peptone suppositories may be used instead.

Subcutaneous injections of sterilized normal saline solution, gr. lx. ad Oj., are also of use, especially if little fluid is retained and the urine is concentrated. From 10 to 20 ounces may be injected at a time, at some spot where cellular tissue is loose, as under the breasts.

In the most virulent forms of septic endometritis and metritis, extending to purulent peritonitis, the most rational treatment is to remove the uterus by hysterectomy, thus getting rid of the primary focus of infection, and securing free downward drainage from the peritoneal cavity. This treatment is, however, very rarely available. If it were adopted as a routine method in septic endometritis, many patients would be mutilated unnecessarily, and the mortality of the disease would perhaps not be reduced. When it becomes clear that nothing else is likely to save life, the patient is generally not in condition to undergo a severe operation, and is very likely to die before it is completed. The best chance of saving life by its means is to perform it as soon as the diagnosis of general septic peritonitis is made.

If sepsis appears to be so profound as to call for such an operation while the inflammatory symptoms are limited to the pelvis, vaginal hysterectomy may be performed in the manner described in Chapter IX. The peritoneum should be left freely open, and the vagina plugged with iodoform gauze. The operation should be performed with clamps only, without any ligatures, both because this method is more rapid, and because a more free drainage of the infected cellular tissue is permitted as soon as the clamps are removed

In general peritonitis, vaginal hysterectomy is inefficient, because it does not allow washing out of the whole peritoneal cavity, especially the fossæ beneath the liver and the spleen, which form the most fatal portions of a general purulent peritonitis.

It is better, therefore, to perform abdominal section, and, if general peritonitis is disclosed, to extend the incision high enough to reach these upper fossæ. The mass of small intestines should be turned out, washed with warm saline solution (gr. lx. ad Oj.), by pouring it from a jug, and any lymph wiped off their surface. The intestines are then covered up with warm towels sterilized by boiling in the same saline solution. The peritoneal cavity should be then washed out thoroughly with the same solution, including the fossæ beneath the liver, stomach, and spleen, the hollows of the loins, and the pelvis, and any excess of fluid sponged out.

If, when this has been done, the patient appears likely to live through the further operation, the uterus may be removed. The general method is that of pan-hysterectomy, described in Chapter IX.; but the procedure should be shortened as much as possible. This may be done as follows:—Having drawn the uterus out of the abdomen, tie the ovarian arteries. Divide the peritoneum in front between the round ligaments about an inch above the level of the bladder, and strip down the peritoneum with the bladder off the front of the uterus and the upper inch of the anterior vaginal wall. Then cut straight through the broad ligaments on each side above the level of the ligature on the ovarian artery up to the wall of the uterus, having first placed a clamp above to check venous bleeding. The uterine arteries are thus divided, and their orifices immediately tied. Open the posterior vaginal fornix from the pouch of Douglas by the aid of forceps pushed up into it from the vagina by an assistant. Next open the anterior fornix, guided by the fingers passed into the vagina through the opening in the posterior fornix. The uterus is now held only by the lower part of the broad ligament and the vaginal attachment at each side, containing only minor vessels. These may be secured by passing up a Doyen's clamp from the vagina at each side, and the uterus cut away, no time being thus expended in securing the smaller vessels. The vagina should then be filled with a plug of 10 per cent. moist iodoform gauze, without any stitching of peritoneum, the end being brought out at the vulva. The abdominal wound is then closed by the most rapid method. If the intestines are so distended that it is difficult to get them back into the abdomen, they may be emptied of flatus by an aspirator, or by cutting a small opening on the edge opposite to the mesentery, and the wounded spot afterwards secured by Lembert sutures of gossamer gut or fine silk.

If the patient appears unlikely to live through hysterectomy, the Fallopian tubes should be tied and removed, if possible, if they appear to be the avenue of infection. Abdominal drainage should then be employed either by Keith's glass drainage-tube (see p. 88), or by a large drain of iodoform gauze, arranged as a Mikulicz tampon (see p. 92), and passed down to the bottom of the pouch of Douglas. If the gauze drain is used, it is advisable to turn the patient occasionally on to the side, and to each side alternately, since in the dorsal position gravity is adverse to the drainage. A glass drainage-tube may, however, be used in combination with the Mikulicz tampon, and the fluid sucked out by a syringe from the pouch of Douglas. Gauze drains may be placed also in the lumbar fossæ of peritoneum.

After the operation, an enema of strong coffee or saline solution may be given at once, and afterward nutrient enemata. In case of collapse, transfusion of saline solution into a vein, and subcutaneous injections of strychnia, may be used.

In acute or subacute endometritis of less extreme degree, such as a gonorrhœal or catarrhal endometritis from cold (with more or less implication of the parenchyma, but without peri-uterine inflammation), absolute rest in bed should be enjoined. If much fever and pain are present, from four to six leeches may be applied near the anus. This is better than applying them to the cervix, since too much disturbance of the patient is thereby involved, and increase of pain is sometimes produced. At the outset, minim doses of tincture of aconite every hour may be given to diminish the fever. Sedatives, with salines, especially the nitrate of potash or acetate of ammonia, should afterwards be administered; or, when pain is acute, full doses of opium or morphia, either by rectum, subcutaneously, or by the mouth. Fomentations or linseed poultices, covered with oil-silk, should be kept applied to the hypogastrium. At a somewhat later stage, hot hip-baths, or copious warm vaginal injections of decoction of poppies, or of linseed or starch, with the addition of a drachm of laudanum to the pint, have a valuable sedative effect. Strong purgatives should be avoided, but it is advisable to keep the portal system depleted by salines, such as sulphate of magnesia and sulphate of soda.

In gonorrhœal endometritis, some authorities recommend the attempt to disinfect the uterus even in the acute stage. The cervix is dilated under an anæsthetic, the uterus washed out with an antiseptic and packed with iodoform gauze. The packing is renewed at intervals without an anæsthetic, and the washing out repeated on each occasion. It appears preferable, however, to trust to the reparative powers of nature at this stage, and only treat the endometrium actively if the discharge persists.

CHRONIC INFLAMMATION OF THE CERVIX, CHRONIC CERVICAL ENDOMETRITIS, ECTROPION, EROSION, AND FOLLICULAR DEGENERATION OF THE CERVIX.

Causation.—The majority of cases of inflammation of the cervix may be divided into two great classes—first, those in which the primary affection is catarrhal inflammation of the lining mucous membrane, and in which the parenchyma of the cervix becomes only moderately swollen, and eventually indurated; secondly, those in which the whole thickness of the cervix becomes inflamed from the injuries received in parturition, and eventually undergoes a process of extensive hyperplasia and induration, while cervical endometritis at the same time persists. The first class comprises by far the greater part of the cases which occur in virgins or nulliparous women, since in them it is rare for the cervix to undergo any great degree of hyperplasia, unless, either from congenital elongation or prolapse, it becomes subject to mechanical irritation.

Of the first variety of cervical endometritis, the predisposing causes are similar to those of catarrhal inflammations of other mucous membranes, such as general debility, and the strumous, rheumatic, or gouty diathesis. Of exciting causes, the most frequent are the effect of cold, extension of inflammation, gonorrhœal or simple, from the vagina or from the body of the uterus, excessive coitus, and direct traumatic causes, such as the use of an intra-uterine stem.

The influence of microbes and of toxins as causes of chronic inflammation will be discussed under the head of Endometritis of the Body of the Uterus. Obviously, microbic inflammation will generally reach the cervix first, and may spread thence to the body of the uterus. A patulous or lacerated cervix in a parous woman will have less capacity for resisting it than the normally narrow cervix of the nulliparous. An acute microbic inflammation may leave as a sequel a chronic inflammation which is not necessarily microbic.

The second variety of inflammation arises from the bruised condition in which the cervix is left after labour, with numerous ecchymoses in its substance, damage to its epithelium, which is soon afterwards shed, and frequently more or less deep lacerations along its edge. The failure in the healing of these lesions, and their passing into a state of chronic inflammation, may be due to the lacerations having been too deep to heal spontaneously, or may be brought about by a too early getting up, by displacement of the uterus, or by any of the causes already enumerated which tend to produce subinvolution (p. 146), or hyperæmia (pp. 161, 167) of the whole organ.

Among the injuries produced by labour, the most important are lacerations of the edge of the cervix. If these are superficial, they may heal more or less completely; and this also happens more readily when the laceration is anterior or posterior. If, however, there is a deep laceration at each side, especially when the frequently associated complication of subinvolution and consequent partial descent of the uterus exists, the anterior and posterior lips of the cervix roll outwards, so as to evert the lining mucous membrane, and the condition termed *ectropion of the cervix* is thus produced. The delicate mucous membrane, turned outwards towards the vagina, is exposed to friction, and becomes inflamed. It then becomes swollen and deeply injected, and its surface granular from irregular proliferation, so that it closely resembles the surface of an erosion, or granular inflammation, at a spot originally covered by squamous epithelium. At the same time, hyperplasia results in the portions of the cervix intervening between the clefts, and leads to distortion and induration. Similar results to those produced by labour may follow if the cervix is bilaterally incised to too great a depth, but generally to much less degree, since the effect is not then assisted by the enlargement of the uterus and bruising of the cervix.

A laceration on one side only may also lead to some degree of eversion of mucous membrane with granular inflammation. The deepest laceration, or single laceration, if there is only one, is more frequently on the left side, because the occiput of the child is generally directed that way. A lateral laceration, at the time of its production, often gives an opportunity for absorption, which leads to local cellulitis. From this a permanent band of thickening is apt to remain, which may be felt running from the angle of the laceration, generally on the left side.

Erosion or granular inflammation of the cervix may originate simply from catarrhal endometritis. The inflammation of the cervical canal extends to the mucous membrane around the os. From the effect of irritation, the squamous epithelium proliferates and becomes softened, while it is, at the same time, macerated in the morbid cervical discharge. It is then shed, in the greater part of its thickness, either gradually or in bulk, and leaves behind a congested and slightly granular surface. Erosion, however, is found more frequently in parous than in nulliparous women, and the more severe forms of the affection are very rarely seen in the latter. In the majority of cases it takes its origin from labour, commencing either with the shedding in bulk of the bruised and damaged epithelium, after parturition, or by its more gradual disintegration, in consequence of the inflammation which is a sequel of that event. A limited patch of granular inflammation, immediately surrounding the os, is, however, not uncommon even in virgins, especially those who suffer from dysmenorrhœa. It generally implies that a condition of catarrhal inflammation or adenomatous hypertrophy exists also within the cervical canal.

These patches of granular inflammation are sometimes called catarrhal patches. According to Ruge and Veit, the cylindrical epithelium which covers them is derived from the deepest, or palisade, layer of squamous epithelium, which is not thrown off. Others think that the cervical mucous membrane, by a process of adenomatous hypertrophy, gradually encroaches on the area of squamous epithelium. This appears more likely, since these patches are almost always continuous with the cervical canal. A detached patch away from it has rather the character of a true abrasion, like that shown in Fig. 110, p. 192, and its epithelium may be entirely lost. It remains uncertain whether the squamous epithelium is detached or disintegrated through inflammation, or whether the proliferating capacity of the cervical epithelium implies the power of absorbing or destroying the squamous epithelium. The former is more probable, since the mucous membrane is generally reddened around a spreading patch of granular inflammation on the nulliparous cervix, and sometimes the squamous epithelium can be easily detached in flakes.

These catarrhal patches have thus the histological character of adenomatous hypertrophy. They are somewhat analogous, when they occur in young virgins, and not as a result of the traumatism of labour, to adenoids of the throat, and often occur in the same people. Both are associated with, or arise out of, chronic catarrh, but have the minute structure of adenomatous hypertrophy rather than inflammation. In this respect they are analogous also to the so-called fungoid endometritis of the fundus.

Others consider that the "catarrhal patches" in the virgin may be sometimes a congenital condition, arising from a persistence of the normal fœtal condition, in which the cylindrical epithelium is said to extend outside the external os.

Pathological Anatomy.—In chronic cervical endometritis, the mucous membrane is swollen and hyperæmic, the glands more especially being enlarged. The secretion is increased in quantity, and becomes more opaque and stringy, often filling the cervix with a tenacious plug. If the inflammation is more severe it becomes muco-purulent or purulent, and has a yellow colour. In a later stage the mucous membrane becomes hypertrophied, filling the cervical canal, and protruding somewhat at the os, and considerable proliferation of the glands of the entire cervical canal may take place. The whole cervix is swollen and soft in the earlier period, but becomes indurated by areolar hyperplasia in the later stage. This change is much greater in those cases in which the disease commences with inflammation of the whole thickness of the cervix after labour, especially when its edge has been cleft by lacerations, in which case the diagnosis from carcinoma may become difficult.

When *simple erosion* arises by detachment of the squamous epithelium *en masse*, the slender papillæ, which, in the normal state, reach nearly to the surface, are carried away at the same time. The surface left is only slightly granular. In more severe forms of the affection, to which the name of *villous or papillary erosion* has been applied, the inflammation proceeds further, and the mucous membrane becomes elevated into soft, deep-red papillæ, which readily bleed. It was formerly considered that the surface becomes entirely denuded of epithelium, more or less of the papillæ being left, and that the villous prominences are due to the overgrowth of these papillæ. According to the researches of Ruge and Veit,* however, the surface always remains covered with a single layer of cylinder-like epithelium, which is really derived from the deepest row of the original squamous epithelium. The normal papillæ are always thrown off; the cylinder-like epithelium grows inward, so as to form

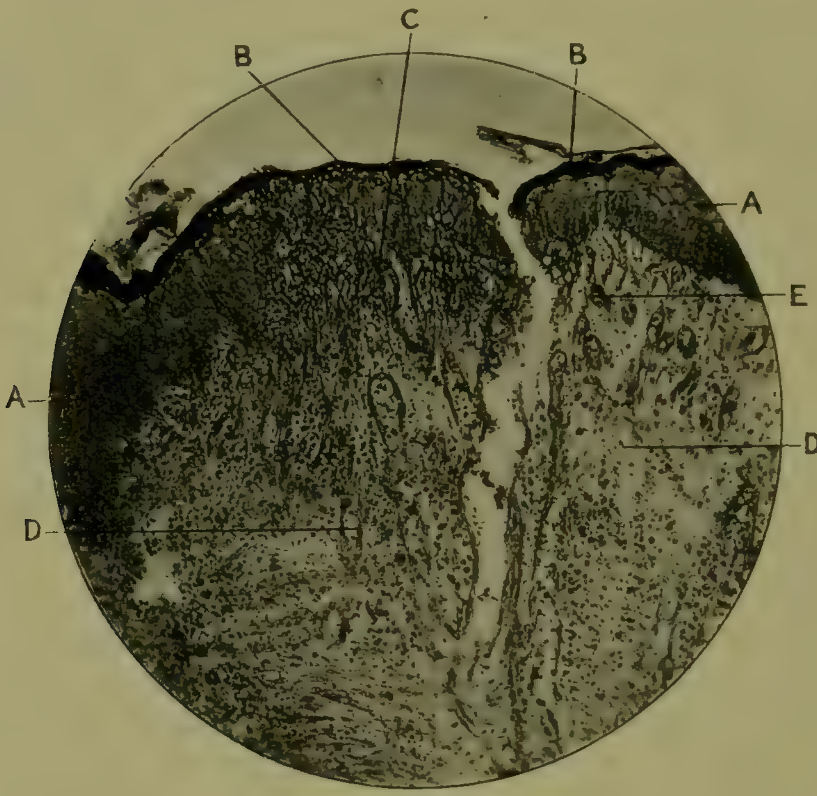

Fig. 110.
Granular Inflammation of Cervix Uteri, at a spot originally covered by squamous epithelium.

A, Normal squamous epithelium. B, Horny layer. C, Remains of inflamed squamous epithelium mingled with inflammatory cells. D, Cellular tissue infiltrated with round cells. E, Section of vessel.

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* "Zeitschrift für Geburtshülfe und Gynäkologie," Bd. ii. Hft. 2.

glandular crypts, and the villous prominences arise by growths of vascular connective tissue between these crypts. In the more severe forms the glandular crypts increase and proliferate. The pathological condition existing is, therefore, ultimately one rather of growth than of inflammation, and forms, in fact, a superficial adenoma of the whole of the mucous membrane affected. The very commencing stage of cancer, according to the same authors, differs from this condition only in the fact that the epithelium of the adventitious gland cavities proliferates so as partially, or entirely, to fill up the acini.

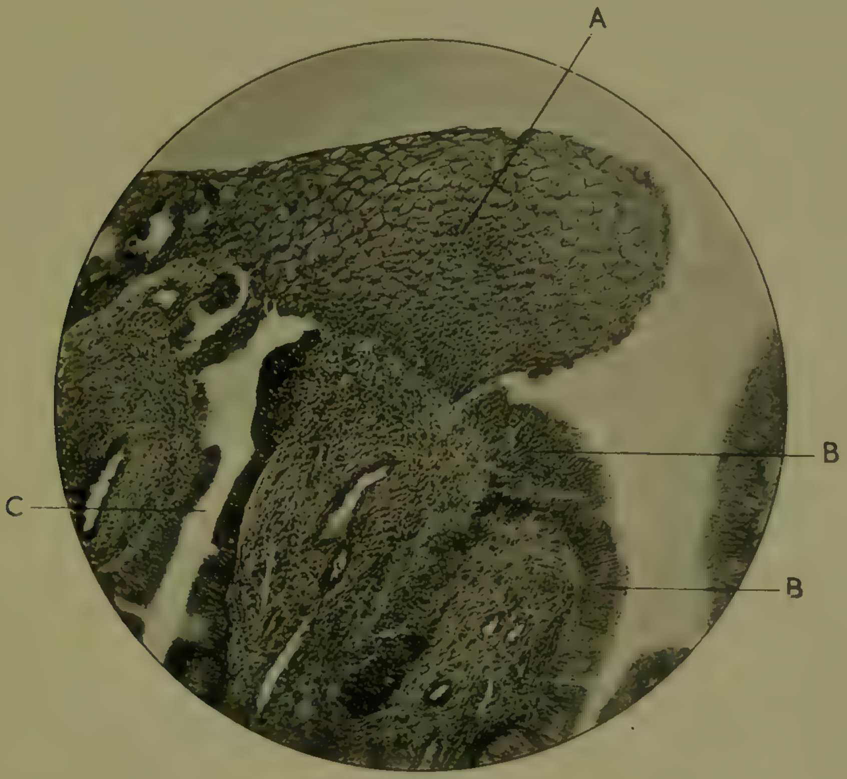

Fig. 111.—Cervical Mucous Membrane everted in consequence of Cervical Laceration.

A, Newly formed squamous epithelium. B, epithelium of everted cervical villi. C, Lumen of gland whose orifice is occluded by the new squamous epithelium.

Micro-photograph by Dr. S. E. Worrall.

I have found, in examining specimens excised during life, that in some instances the histological characters correspond to those described by Ruge and Veit, but in others there is actually complete loss of epithelium at some points, and the tissue near the surface is infiltrated with numerous inflammatory leucocytes, and contains many distended capillaries. The Malpighian layer of the adjacent squamous epithelium generally grows thinner as it is traced toward the inflamed surface, the horny layer being thrown off, and is destitute of the normal papillæ. Often over the apparently eroded surface, originally covered by squamous epithelium, may be seen patches of cylindrical epithelium, adjoining the glandular crypts, and alternating with patches of ill-formed squamous epithelium, only one, two, or three cells deep. In Fig. 110, p. 192, is shown a micro-photograph of a commencing erosion, at a spot originally covered by squamous epithelium. The epithelium is not lost, but it will be noted that the inflamed spot is elevated above the surrounding surface, although but little epithelium remains. The epithelium near the surface is seen only in irregular patches (C) mixed up with round inflammatory cells, and some formed fibrous tissue. A relic of the horny layer (B) remains on the surface. The cellular tissue beneath is extensively infiltrated with inflammatory cells (D), and its vessels are distended (E). This specimen does not show the persistence of the deepest palisade-layer of squamous epithelium described by Ruge and Veit, nor its conversion into an apparent cylindrical epithelium.

In cases which were formerly described simply as villous erosion, it will often be found, if the experiment be tried of taking a tenaculum hook in each hand and drawing together the two lips of the cervix within a Sims' speculum, that the villi really belong to the cervical canal, and arise by hypertrophy of the prominences naturally covered by cylindrical epithelium, not of the normal papillæ beneath the level surface of squamous epithelium. In old cases of laceration the epithelium of the exposed cervical mucous membrane may be found more or less completely converted into squamous epithelium, beneath which are often many of the glandular cysts described below.

In Fig. 111, p. 193, is shown a micro-photograph of an apparent villous erosion, really formed by the everted villi of the cervical canal. It will be seen that at the tips of the villi, which have been exposed to friction or irritation, a thick layer of squamous epithelium has replaced the cylindrical epithelium at disjointed spots. The section also shows how the orifices of glands become blocked by squamous epithelium, and thus the gland becomes distended by secretion into a small cyst.

Opinions have differed as to whether the so-called erosion deserves the name of "ulceration." It is clear that, although in the initial stage in some instances there is a loss of substance of vascular papillæ as well as of epithelium, and the process must therefore be admitted to come, strictly speaking, within the definition of the word ulceration, yet there is no progressive ulceration, the condition being rather that of inflammation with eventually glandular hypertrophy. The term "ulceration" is therefore one which is needlessly alarming to patients. In a large proportion of cases the villi are simply the everted villi of the cervical canal, hypertrophied from irritation, and there is no loss of substance, or of epithelium, at all.

In another and less important form of erosion, which has been called *aphthous or herpetic erosion*, inflammation of the mucous membrane leads to the formation of small vesicles, which burst and leave an eroded spot. These generally heal readily without treatment.

Cystic degeneration may arise from closure of the mucous glands by swelling of the mucous membrane, and adhesion of the edges of the orifice, or by formation of new squamous epithelium, as illustrated above. The glands then become distended into small cysts, known as *ovula Nabothi*. Within the cervical canal, the swelling cysts force up the mucous membrane into an elevation, and often take the form of minute polypi. Further development of these, with associated hypertrophy of the cellular tissue surrounding them, forms the typical mucous polypus. Similar small cysts are often found on the vaginal surface of the cervix, but these do not so easily elevate the denser mucous membrane. They may be seen, and more readily felt, as minute protuberances beneath it (*see* Fig. 113, p. 202). According to Ruge and Veit these are not pre-existing glands, but are formed under the influence of irritation from the *rete Malpighii* of the squamous epithelium. They may thus never have had any patent excretory duct.

If, however, the Nabothian glands are numerous under squamous epithelium, it will generally be found that what appears to be the outside of the cervix is really the everted cervical lining, the epithelium of which has been converted into squamous epithelium by prolonged exposure or the use of caustics.

The occluded follicles vary from that of a small shot upward, rarely exceeding the size of a pea. When simply occluded, their appearance is that of a bluish-red elevation of the mucous membrane, and their contents when evacuated are a clear mucus. But frequently the larger ones have a yellowish or opaque white appearance, and their contents, when they are punctured, show a similar colour and are no longer translucent. This indicates inflammation of the follicles, but whether it means that micro-organisms are present has not been determined.

If the inflammation in the distended follicles is more severe, or their contents increase, they may burst, and give rise to *follicular erosion.*

Results and Symptoms.—The cervix is, in general, but slightly sensitive, as is shown by the fact that nitric acid or other strong caustic may often be applied to its inflamed and eroded surface without causing any very great discomfort. Inflammation limited to the cervix, therefore, generally causes comparatively little pain, and pain may even be absent altogether. The pain most characteristic of cervical inflammation is situated over the sacrum, and not very severe in character. If the inflammation is not limited to the mucous membrane, but has affected the whole tissue of the cervix and led to hyperplásia, pain in the back and loins is generally more marked, and is often increased by walking, while pain may also be produced by coitus. A more constant symptom than pain is morbid secretion, and thus, in many cases, the presence of leucorrhœa or "whites" may be the only indication for investigating the condition of the uterus. If, however, the discharge is thick in character, it may be retained in the vagina, and the patient may then not notice any leucorrhœa, although the altered secretion is manifest on the use of the speculum. In the slighter forms of catarrh, the discharge, as it issues from the cervix, is like the normal secretion, clear and glairy, resembling unboiled white of egg, but more or less increased in quantity. It often becomes more tenacious than normal, forming a tough plug in the cervical canal, which is difficult to detach. Strings or flakes of such mucus may escape from the vagina, and be noticed by the patient, especially if hardened by the use of astringent lotions.

When inflammation is more severe, the discharge becomes muco-purulent or purulent, and then has a yellow tinge. Such alteration of colour usually means that pus cells are present in the mucus, and that the catarrh is microbic. It may then, by its irritating effect, set up vaginal inflammation. Thus it is often found that there is reddening of the outside of the cervix, and of the upper part of the vagina in its vicinity, the lower part of the vagina having its normal colour. As it escapes from the vulva, the appearance of the discharge is opaque, milky white in the slighter forms, yellowish or greenish in the severer forms of inflammation. Occasionally it may be tinged with blood. If the discharge is profuse and long-continued, it may form a drain which tends to weaken the system. Hyperplasia of the cervix often leads to irritation of the bladder or rectum, as the result of pressure, especially if any anteversion or retroversion be present.

The cervix is more richly supplied with sympathetic than with sensitive nerves, and thus its inflammation is apt to lead to reflex congestion of the body of uterus and ovaries. When this occurs there may be more severe pain, menorrhagia or metrorrhagia, and even more distinct reflex symptoms, such as nausea, vomiting, dyspepsia, vertical headache, intercostal neuralgia, and hysterical manifestations. Such reflex symptoms are generally not so marked in inflammation of the cervix as in that of the body of the uterus, and their existence generally implies that the body of uterus or ovaries are involved in congestion, if not in actual inflammation. The whole question of distant reflex symptoms dependent upon uterine conditions will be discussed more fully under the head of Endometritis. In many cases of cervical inflammation there is more or less extension, not merely of congestion, but of actual endometritis to the body of the uterus. Inflammation limited to the cervix, or erosion, may persist for a long time with but little affection of the general health, but it is often associated with dyspepsia and general failure of nutrition, which may be partly the cause and partly the consequence of the persistence of the uterine affection.

The condition of the cervix especially which results from laceration in parturition may often persist for a long time without attracting any attention, no symptom existing beyond a slight excess of secretion. The patient may then come for advice only when the symptoms are aggravated by some catarrh or congestion, many years after the delivery which gave rise to the laceration. Apparently, the lesion may never attract any attention at all, until an epithelioma or carcinoma supervenes, to which it has been a predisposing cause.

An erosion, while generally in the first instance the result of some other condition, as endometritis or inflammation of the whole substance of the cervix, itself often becomes a source of reflex irritation, and maintains a hyperæmia not only of the cervix but of the body of the uterus and the ovaries; all of which are frequently found to be enlarged and tender in conjunction with such a condition. Under these circumstances menorrhagia is often a prominent symptom, and the first thing necessary in its treatment is the cure of the disease of the cervix. In the case of villous erosion, coitus often gives rise to slight hæmorrhage, and this may be the chief symptom which attracts the patient's attention. In cervical inflammation sterility is often produced by the obstruction to the spermatozoa formed by the plug of mucus in the os, or by the deleterious influence upon them of the cervical secretion. These obstacles do not, however, always form a bar to conception ; and if pregnancy occurs the resulting hyperæmia tends to render worse any inflammation, and especially any erosion, which exists. From this cause may arise hæmorrhage during pregnancy, uterine pain, severe vomiting, or other reflex symptoms, and abortion or miscarriage.

The natural course, both of chronic cervical endometritis and of erosion, is a very tedious one, with but little tendency to recovery, although a cure may result by improvement of general health. They are fairly amenable to treatment, but improvement is often slow, and persistence in treatment for four or six months is not infrequently requisite. If there is extensive hyperplasia of glands, cure can only be effected by vigorous measures. Long-standing hyperplasia of cervix, with induration, is little amenable to remedies other than operative.

The granular inflammation of the mucous membrane of the cervical canal everted in cases of laceration of the cervix is very similar in its effects, as well as in its histological characters, to that of the portion of mucous membrane originally covered with squamous epithelium. In course of time, sometimes after the lapse of years, cylindrical having been replaced by squamous epithelium, the leucorrhœa and other symptoms may subside, although some degree of hyperplasia of the everted cervix is apt to remain permanently. But the cicatricial epithelium is apt to break down under any fresh cause of inflammation ; there are generally numerous occluded glands under the surface which tend to keep up congestion ; and the cure is never so perfect and permanent as that which may be obtained as the result of a plastic operation.

Since cancer of the cervix is excessively rare in virgins, commoner in parous than in nulliparous women, and still commoner in those who have had many children, it appears certain that erosion or other form of inflammation, and especially the effects of laceration in parturition, may be the starting-point of cancer in persons predisposed to that disease. In some of the very rare cases of cancer of the cervix uteri occurring in virgins, I have had reason to suppose that masturbation might be a predisposing cause.

Some authorities deny the connection between inflammation of the cervix, especially the lacerations due to parturition, and cancer. It is a general principle, however, that cancer rarely affects a tissue which was previously perfectly healthy, and that any chronic irritation predisposes to it. It is known, moreover, that cancer is especially liable to affect the orifices of the body, where there is a change in the character of the epithelium.

This view of the relation of cervical inflammation to cancer is confirmed by the close approximation found by Ruge and Veit and others in the histological characters of villous erosion toward those of commencing cancer. Not only does the proliferation of the crypts between the papillæ form an adenomatous growth which may go on to develop into glandular carcinoma; but there are irregular, atypical patches of squamous epithelium formed under the influence of friction, caustics, or irritation, which may be the starting-point of squamous epithelioma.

In several cases I have had the opportunity of observing carcinoma or epithelioma supervene upon chronic granular inflammation at the site of the granular patch, sometimes after a long interval, during which the patient had not been seen, the menopause and several years of quiescence having intervened.

More often still, at a very early stage of cancer, I have found the disease to be associated with a previously existing laceration, sometimes to be situated just at the angle of the laceration. The latter condition is very unfortunate for the patient, for the disease commencing just at the junction between cervix and cellular tissue, if the laceration has been deep enough to reach the vaginal reflection, the cellular tissue is infected from the first, and the stage at which eradication is possible is very soon passed.

Hence it is of great importance not to omit the due treatment of granular inflammation when the age has been reached at which cancer becomes probable; an age which, in the case of the cervix uteri, must not be reckoned as much beyond thirty years.

Diagnosis.—In simple cervical endometritis, vaginal touch may reveal only slight enlargement, or may fail to detect anything. The speculum will show the os to be congested, and generally either pouring forth copious clear viscid mucus, like white of egg, or filled with a more tenacious and opaque plug of similar mucus. The characteristic glairy mucus may sometimes be observed in the vagina when the os does not happen to contain any. If the plug be removed by twisting it round a Playfair's probe wrapped in cotton-wool, the interior of the cervix is seen to be red, swollen, and granular, a condition which is more manifest if the bivalve speculum (Fig. 29, p. 45) is used, and expanded rather widely so as to stretch open the os. The mucus is clear and alkaline as secreted by the cervix, but becomes opaque and acid in the vagina. This change is now attributed to the action of microbes, which are always present in the vagina.

If there is a doubt whether the secretion found in the vagina comes from the uterus or the vaginal walls, and it is particularly desired to decide the point, the vagina may be washed out overnight. A plug of cotton-wool is then taken, large enough to fill the diameter of the vagina, dipped in a solution of tannin, squeezed as dry as possible, and then passed up so as to lie just below the cervix. On examination in the morning, any vaginal discharge will be found below the tampon; that coming through the cervix will lie above it.

It is very difficult to tell whether discharge coming through the cervix is produced by the cervix only, or comes from the body of the uterus also. The special character of the cervical mucus, when not greatly altered by inflammation, is its tenacious quality. Hence a firm plug of mucus, difficult to detach from the cervix, or found in strings and threads in the vagina, may be taken as secreted by the cervix. If the discharge is thinner, especially if it is muco-purulent or purulent, or stained reddish or brownish, it is more likely to come in part from the fundus. In case of doubt, disturbance of menstruation and tenderness of the fundus are indications that the fundus partakes in the inflammation and is partly the source of the discharge. Failure to cure the discharge by treatment directed to the cervix is another indication in the same direction.

Laceration of the cervix is generally easily detected by the finger. The clefts are felt, generally at the sides, and reaching more or less nearly up to the vaginal reflection; or there may be triradiate or stellate clefts. In the case of bilateral laceration.

the cervix is broader from before backward than from side to side. The two lips are felt, often bulging and hardened in the centre, and overlapping in the front and at the back. This is to be distinguished from the mushroom-like shape sometimes felt in early carcinoma, in which the overlapping is all round, and not at the front and back only.

In most of the cases occurring after delivery, broadening of the cervix from hyperplasia will be detected by the finger. Abnormal hardness of the tissue of the cervix itself, not of the cellular tissue around, is characteristic of chronic inflammation and hyperplasia, not of cancer, provided that there is no friable surface.

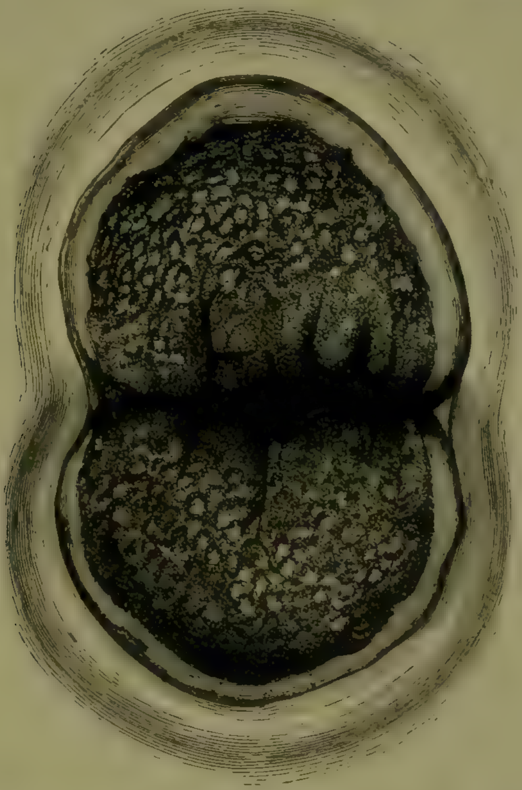

Fig. 112.
Bilateral Laceration and Ectropion of Cervix, with Granular Inflammation of exposed Mucous Membrane.

In the case of considerable enlargement of the cervix, that due to inflammatory hyperplasia is distinguished by its affecting chiefly the tissue between clefts, and thus producing an irregular shape. Fibroid growths, or spindle-celled sarcoma, produce localized rounded masses, independent of clefts. Congenital elongation produces uniform enlargement of the whole cervix. The cervix may also be uniformly enlarged, but without special elongation of the vaginal portion, from hyperplasia consequent on the congestion due to prolapse.

In ectropion arising from bilateral laceration of the cervix, the condition existing is often more manifest to the finger than to the speculum. If, however, a Sims' speculum is used, and the lips of the os are drawn together into their original position by two tenaculum hooks, the exact relation of parts will readily be observed. The hook held in the right hand catches the tip of the posterior lip, that in the left hand the anterior, and the shanks are crossed. As seen in a speculum, especially if a bivalve is used, the antero-posterior diameter of the cervix appears increased as shown in Fig. 112, p. 201. The everted arbor vitæ of the cervical canal, with hypertrophied median and oblique ridges, may often be recognized, if not too much transformed by inflammation.

When the two lips are drawn together through the Sims' speculum, by aid of the two hooks, the greater part, or the whole, of the apparently eroded surface, if granular inflammation exists, may be turned inward toward the cervical canal; but this surface generally extends beyond the limits originally covered by cylindrical epithelium, which normally passes into squamous epithelium at a point about an eighth or a quarter of an inch above the external os. Thus a portion of granular surface may still be visible, after the inversion. In cases of laceration of many years' standing, the bulging of the hypertrophied and indurated tissue in the centre of each lip may render the inversion incomplete.

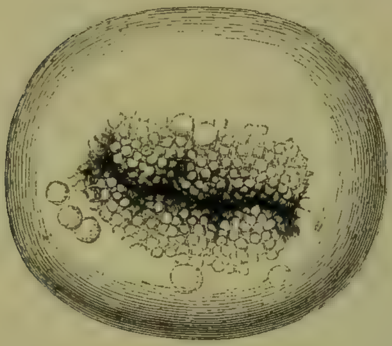

Fig. 113.
Granular Inflammation of Parous Cervix, with Ovula Nabothi.

The more severe kind of erosion, or granular inflammation, is easily recognised by the touch as a soft, villous, velvety surface. A simple erosion feels softer and more granular than the normal mucous membrane, and is almost always associated with some broadening of the cervix. In the healthy cervix a *tactus eruditus* may always determine the negative as to erosion, but there may sometimes be an uncertainty in distinguishing by touch between a slight existing erosion and one that is healed, or an irregularity due to hyperplasia or degeneration of glands. The speculum will always resolve the doubt, and show the erosion as a circumscribed, deeply red, granular, or villous surface, rather elevated above than depressed below the surrounding mucous membrane (Fig. 113). In the more severe form of erosion bleeding is readily produced by contact with the speculum, and even by the finger, especially on firm manipulation; but a great proneness to bleed on a gentle touch with the finger should always raise the suspicion of the presence of commencing cancer. Difficulty is often found in introducing the sound in a case of cervical endometritis from its point catching in the folds of the swollen or hypertrophied mucous membrane, and when this is the case slight bleeding may be produced. Otherwise, if there is no complication with corporeal endometritis, the sound may be passed to the fundus without causing bleeding, or the pain which usually follows its introduction in that disease.

Treatment.—Constitutional remedies are of great importance, though local treatment is usually required in addition. Nourishing, but not too stimulating, diet, with abundance of fresh air, and gentle exercise without fatigue, are to be enjoined. Causes of mental depression should be avoided as much as possible, and change of scene is often of great value. Any depressing influence, such as prolonged lactation, should be removed. The medicinal treatment should be of a tonic kind, with special reference to the impaired digestion which is a usual concomitant. Nitro-hydrochloric acid, with nux vomica or strychnia, and a vegetable bitter, to be taken directly after meals, is a useful prescription.[*] If there is much stomach irritability, bismuth, with or without small doses of morphia, may be substituted for the bitter. When the digestive function is re-established, Battley's liquor cinchonæ, tinctura cinchonæ flavæ, or quinine, may be given in place of a simple bitter. Iron is apt to disagree when there is any sign of liver inaction or portal congestion, or when the case is complicated by metritis or hyperæmia with considerable tenderness of the uterus. But in the absence of these, especially in later stages, it may be usefully given in combination with a laxative.[†] Passive hyperæmia should be treated by the means enumerated under that heading, and any displacement of consequence rectified.

If acute pain or tenderness of the cervix is present, it is well to commence with local depletion (*see* p. 164); and if extensive degeneration of the cervical glands is detected, the depletion may be effected by scarification of the lining membrane of the cervical canal with a narrow-bladed knife. Any prominent glands on the vaginal surface of the cervix should be punctured and touched with strong carbolic acid or iodized phenol, since they keep up irritation by their presence. Coitus should be prohibited while any notable tenderness exists, and placed under strict limitation at all times.

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[*] ℞ Acid. Nitro-hydrochlor. dil. ♏x.; Tinct. Nucis Vomicæ ♏x.; Tinct. Gentian. co. ʒj.; Aq. ad. ℥j.—ter quotidie.

[†] ℞ Ferri et Ammon. Citrat. gr. v.; Magnes. Sulphat. gr. xxx.; Sp. Chloroform. ♏xv.; Glycerin. ʒj.; Aq. ad ℥j.—ter quotidie. A formula for iron very readily tolerated, when a laxative is not required, is the following:—Ferri Tartarati, gr. v.; Glycerini, ʒj.; Sp. Vini Rectificat. ʒss.; Aq. ad ℥j.—ter quotidie. Oppenheimer's bipalatinoids of ferrous carbonate are even more useful.

Of local applications, the simplest are vaginal injections, which should always be used at least twice a day to wash away the secretion, if for no further object.

Injections of water, for removal of secretions, should generally be used moderately warm. For relief of congestion, as will hereafter be described, hot water at 110° to 115° F., and used in large quantities, is often very effective. Emollient or alterative lotions should be used warm. If an astringent effect only is desired, the lotion may be cold in summer, and in winter at a temperature of about 60°. Syringes of pewter and glass do not contain sufficient fluid for ablution, and the latter are dangerous from the risk of breakage. Higginson's syringe (Fig. 114), provided with a vaginal tube about six inches long, and having a central ball, by compressing which a steady stream is produced, can be used by the patient herself more effectively. For the use of water for cleansing purposes, she may be in a sitting position over a bidet or ordinary chamber utensil. But water for the prolonged application of heat or cold, and lotions for any purpose, can only be used effectually when the patient is lying down in the dorsal position, so that the fluid does not flow away immediately, but distends, in some degree, the vagina. The best receptacle for her to lie upon is the "ladies' bed-bath" (Fig. 115, p. 206), which may be provided with an elastic tube to carry away the fluid to a vessel on the floor. In resting upon this the hips are elevated, the back being supported, if necessary, by a folded blanket or very thin pillow. In the absence of this, if a moderate quantity of fluid only be required, she may lie upon a round bed-pan, brought well under the hips, so that it is not too much tilted. A large quantity of fluid may also be used, as in irrigation by hot water, if the patient lies crosswise on a low bed or sofa, the feet on a couple of chairs, a mackintosh being so arranged as to carry down the fluid into a foot-pan.

In the dorsal position, the patient cannot generally work the Higginson's syringe conveniently herself. If the services of a nurse, or other attendant, are available, the best plan is for the nurse to use it. It is maintained by Emmet that, in the use of hot water, the discontinuous stream of the Higginson's syringe is more effective in stimulating the vessels and absorbents than the continuous stream of an irrigator. Generally, if the patient has to manage the injection herself, it is best to use some form of irrigator. The fountain irrigator (Fig. 116, p. 207) is a very convenient form of apparatus, and if made of glass, as shown in the figure, is more easily kept aseptic. The reservoir must be raised about three feet above the patient. In another form, the reservoir is a bag, which can be hung upon a nail, and which folds up, to be contained in a small tin box. For prolonged use of hot water it is better to have an ordinary hot-water can fitted with a delivery tube attached to a tap near the bottom. In the use of either of these, the taps are first opened until the fluid begins to flow, so as to get rid of the air in the tube, and then the tap at the delivery tube is shut off, until the tube has been introduced into the vagina. By this tap, also, the rapidity of the flow may be regulated. A cheaper and more portable form of irrigator than the can is the syphon irrigator (Fig. 117, p. 207), which has a weighted end to keep it under the water, and is stiffened at the bend to prevent its collapsing. In using this, the tap is first opened, and the whole tube gradually immersed, the delivery tube last, so as to fill it all with water. The tap is then turned off, and the tube taken out of the water, except the weighted end, and the syphon is by this means formed. Another mode of forming the syphon is to open the tap, place the weighted end in the water, and then empty the bulb on the tube by squeezing it; then to close the tap and let the bulb expand.

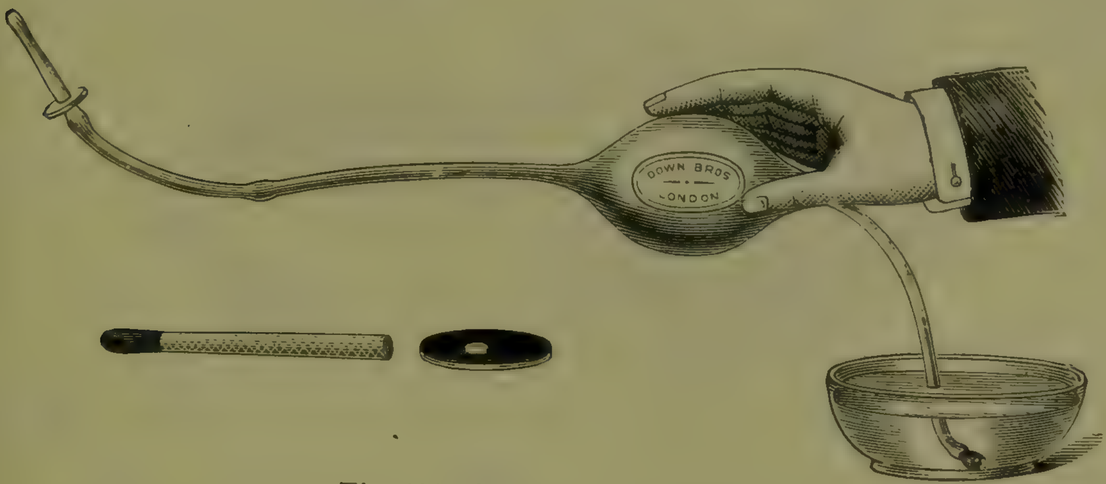

Fig. 114.—HIGGINSON'S Syringe.

For the employment of a small quantity of lotion a more convenient mode is to use a simple india-rubber enema syringe (Fig. 118, p. 208), containing about four or six ounces, and having a vaginal tube. If the effect of lotion only is desired, the patient may first use the Higginson's syringe herself with warm water, then lie down on a bed-pan, and inject slowly one or two small syringefuls of the lotion, remaining five or ten minutes in the same position to allow the lotion to have its full effect. When she rises, the remainder of the lotion flows away. If a nurse administers the injection, before removing the bed-bath or bed-pan she should depress the perineum with one finger, and gently compress the hypogastrium, to get rid of the excess of fluid, and finally place a napkin against the vulva to absorb any that may remain.

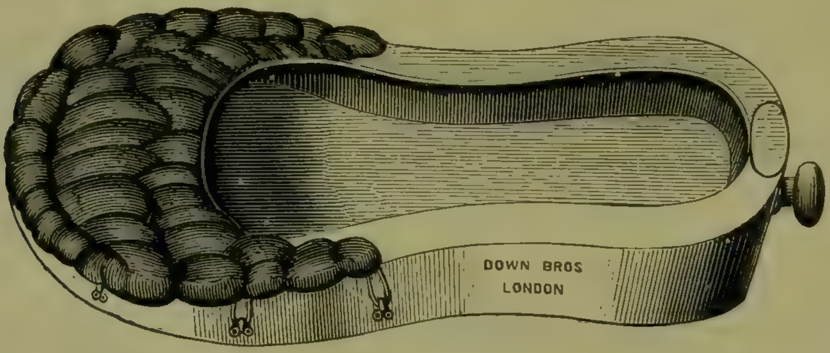

Fig. 115.—Ladies' Bed-Bath.

For an emollient effect an ounce of glycerine, or a drachm of borax, carbonate of potash, carbonate of soda, chloride of ammonium, or chlorate of potash, to the pint of water may be used; while the salts tend also to diminish the cervical secretion. The glycerine may be added in combination with one of the salts, and, if a more sedative effect is desired, from one to four drachms to the pint of tincture of opium. For a more astringent effect, alum, iron-alum, tannin, or sulphate of zinc may be used. The strength should be from twenty to sixty grains to the pint in the case of sulphate of zinc, and from one to three drachms or more to the pint for the rest. The liquor plumbi subacetatis dilutus is also a valuable remedy, and is less apt to irritate than most of the astringents, but it has the inconvenience of occasionally staining the linen brown, from formation of a sulphide. If the discharge is at all offensive, or if it is due to the extension of gonorrhœa to the cervix, antiseptic lotions are often of use. Perchloride of mercury (1 in 4,000—1 in 3,000), carbolic acid (1 in 100—1 in 60), chloride of zinc (gr. xx. to gr. xl. ad Oj.),

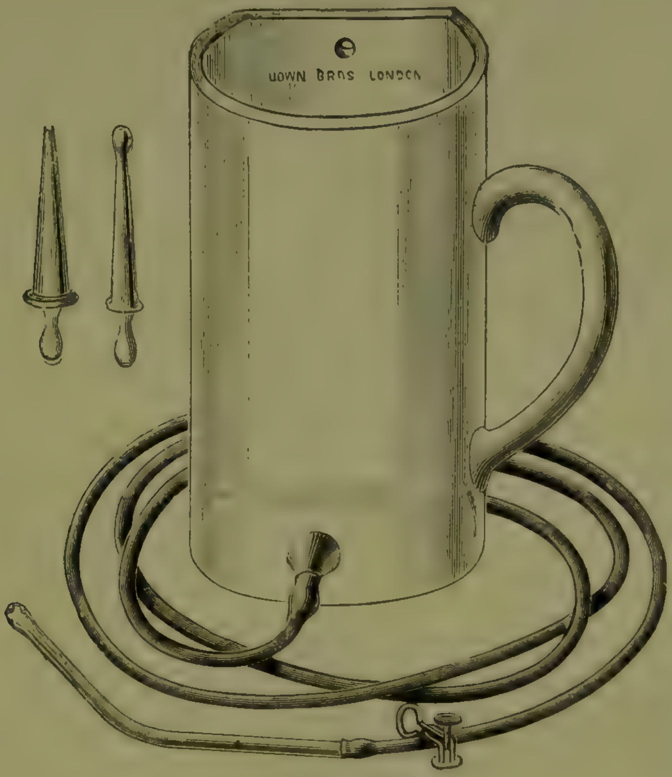

Fig. 116.—Fountain Irrigator.

formalin (1 in 1,000—1 in 500), may then be used. Chinosol (15 gr. ad Oj.) may be conveniently combined with an astringent,

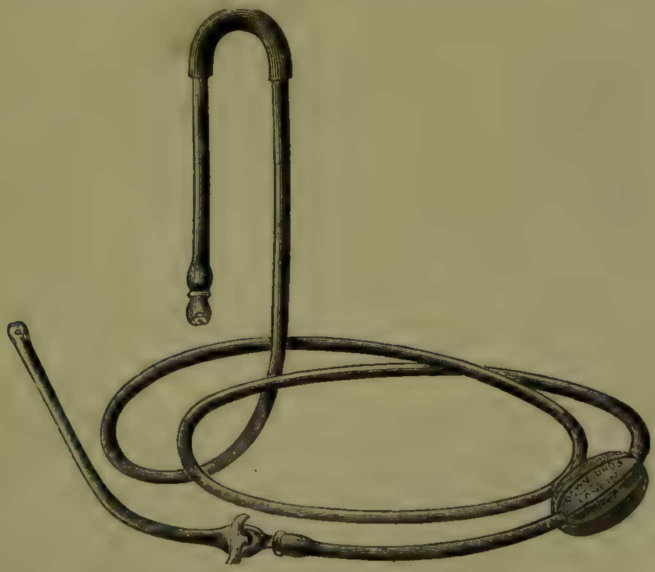

Fig. 117.—Syphon Irrigator.

such as alum or sulphate of zinc, and is an efficient germicide. Other powerful germicides are sulphurous acid (1 in 100—1 in 40), and peroxide of hydrogen, which may be used in the form of Eau Maiche, or Marchand's hydrozone (1 in 30—1 in 20).

If the lotion is prescribed in fluid form for use, it should be ordered of double strength, and the patient should add an equal quantity of hot water at the time of using. In rare cases, severe pain, uterine and peritoneal inflammation, and even death, have arisen from the use of a vaginal injection. This has probably been due to the patient having inserted the tube into the patulous cervix of a retroverted uterus. Caution should therefore be used in recommending injections while such a condition exists unremedied; and whenever the os is at all patulous it is a safeguard to have the vaginal tube with no terminal, but only lateral, openings. In some cases the disastrous result may have been due simply to the stimulus of the lotion causing contraction of the uterus and Fallopian tubes, and so forcing purulent fluid into the peritoneal cavity. It is well, therefore, especially with neurotic patients, to begin with a weak lotion, and gradually to increase the strength.

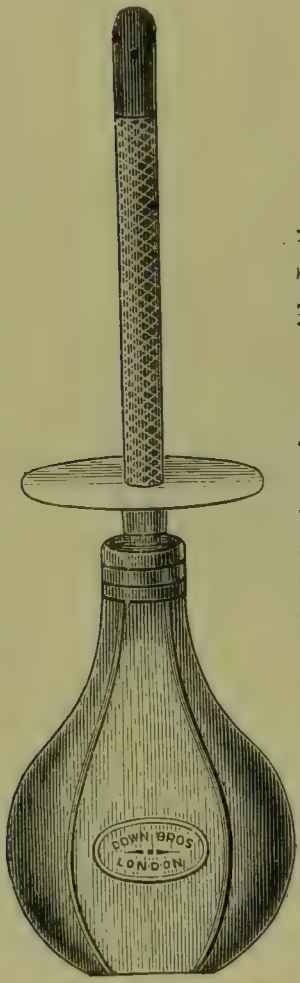

Fig. 118.—Vaginal Syringe for use with Lotion.

These lotions have naturally more effect upon vaginal discharge than upon cervical; but they penetrate to some extent into the cervix, especially the comparatively patent cervix of parous women. On a narrow conical nulliparous cervix, plugged with tenacious mucus, they have but little effect, unless the cervix is previously dilated.

Astringent and alterative drugs may also be dissolved in glycerine, and used in the mode described at page 166. The most useful are ichthyol, borax, tannin, or acetate of lead, in a strength of from thirty to sixty grains to the ounce. The last is especially serviceable in the case of erosion, the astringent contracting the vessels, while the glycerine depletes the congested surface. For the same cases, fifteen grains of iodoform in fine powder suspended in three drachms of glycerine form also a very useful application. Astringents may also be employed in the form of suppositories, of which the most serviceable are those containing five grains of tannic acid or acetate of lead. As a basis for suppositories, a combination of one part of powdered gelatine moistened and gently heated with three parts of glycerine is much preferable to cocoa-butter.

Local Applications to the Cervix.—In the cervical leucorrhœa of virgins, a fair trial should be made of the means already enumerated before resorting to the speculum, which, for obvious reasons, should not be used in their case, if it can be avoided. In married women, however, the speculum may be used at once for diagnosis, and if severe erosion or glandular degeneration is detected, the necessity for stronger direct applications may be immediately recognized. The object should be to effect a cure, if possible, without leaving any cicatricial tissue, and, hence, the mildest remedy likely to prove effectual should be tried first.

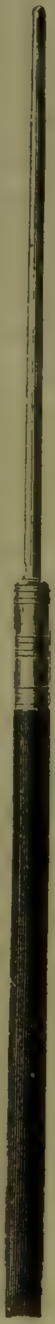

Fig. 119.—Playfair's Probe.

The solid nitrate of silver, which at one time was the favourite remedy in all cases, is now less generally preferred, since it may sometimes cause considerable irritation and hæmorrhage, if vigorously applied, and, in severe cases, is not so effective as other measures. It is most suitable for a case of simple erosion, the surface of which may be touched lightly over, so as rather to form a protecting film than to have any deep caustic effect. This may be repeated two or three times at intervals of a week, but not too often. A tapering pointed stick of nitrate of silver may also be passed, on one or two occasions, into the cervical canal, when there is granular inflammation of the cervix. It is to be remembered that the solid nitrate of silver is more likely to cause cicatricial contraction than other caustics. It should, therefore, never be used unless the canal is patulous, and some degree of contraction is desirable.

The solid nitrate of silver may also be used for the purpose of destroying and converting into squamous epithelium either the adenomatous surface of an everted lining membrane, or one formed by adenomatous hypertrophy extending outwardly. For this purpose the applications should be very thorough, but not made more than once or twice.

Liquid applications may conveniently be made to the vaginal surface of the cervix with a small wad of compressed cotton wool.

grasped by a holder or forceps having a catch at the handle, and to the cervical canal by means of Playfair's probe (Figs. 119, 120). If a little absorbent cotton-wool is first spread out in a thin layer, and then wrapped round by rotating the probe, it becomes very firmly attached, and may then be dipped in the liquid to be used. If the probe is notched at the sides and bulbous at the extremity, as is the case with probes frequently sold, it is a very troublesome process to remove the cotton-wool, unless by burning it off. It is better to have no bulb at the end, and simply to roughen the probe slightly by rubbing it longitudinally with sand-paper. The wool is then held quite firmly enough for the application, if carefully wrapped, and yet can easily be pulled off. If there is difficulty in removing the wool, the best plan is to cut it off piecemeal with scissors, giving the probe a shake in a basin of water between each cut, so as to loosen the wool. The terminal portion of the probe should be made of aluminium, that it may resist nitric acid and iodine, and should be as much as three inches long, so that it may be used for application to the body of the uterus if desired.

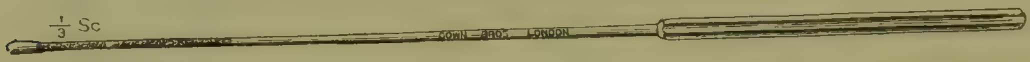

Fig. 120.—Playfair's Probe of Aluminium, in one piece.

An improved form of the instrument is shown in Fig. 120, the whole being in one piece, and made of aluminium. An ordinary uterine sound of copper, plated, may be used very well for cervical applications, if devoted to this purpose alone. Iodine and other applications remove the plating, but the sound will, nevertheless, last a long time. The copper is more readily bent than the aluminium to any desired curve, and there is no joint or union to get loose. In this case, if a very thin layer of dry cotton-wool is wrapped round the sound with some dexterity, the bulbous extremity prevents any risk of the cotton wool being drawn off and left in the uterus. It also prevents its being pulled off after use, so the cotton must be cut off with scissors in the manner mentioned above.

For the application of nitric acid, in the absence of an aluminium probe, a vulcanite sound may also be used. For making the application, Sims' speculum and the semi-prone position are the best, but, in the absence of an assistant, the probe may be used with any other speculum, especially a short Ferguson's (*see* p. 44), short bivalve, or Neugebauer's speculum (Fig. 40, p. 51), which may be so manipulated as to bring the uterus into a position of slight retroversion. Before any application is made, the tenacious mucus should be removed from the cervical canal by entangling it in a swab of cotton-wool, or, what is better, a small fragment of sponge, not to be used a second time. This is facilitated if a swab of glycerine, or white of egg, is first used.

Of the milder remedies, a solution of nitrate of silver, of thirty or sixty grains to the ounce, is by some preferred to all others, but it must be applied rather frequently, namely, at intervals of from five to seven days. A useful mild application to an erosion is Richardson's styptic colloid, consisting mainly of tannin dissolved in collodion. This forms a protecting film, as well as being astringent, and may be used at intervals after one or two applications of a stronger caustic. Dr. Atthill recommends the addition to it of fifty grains of carbolic acid to the ounce. The liquor iodi fortis may also be used, or a saturated tincture of iodine known as Churchill's tincture of iodine,[*] which Dr. Churchill recommended to be applied once a week to the whole cervix as an absorbent in hyperplasia, after a single application of nitric acid. For an erosion which very readily bleeds, the liquor ferri perchloridi fortis may be used.

Perhaps the most widely useful of all applications, both for the cervical canal and for erosions, is strong carbolic acid, a caustic of medium strength, which leaves little pain behind, since it has a somewhat anæsthetic effect upon the tissue, and is not likely to produce contraction or occlusion of the os. It may be used either simply liquefied by the addition of a sixteenth part of water, or an equal quantity of glycerine may be mixed with this. For erosions the stronger application is preferable. Care must be taken to protect the vagina and vulva. Two or three applications may be made at about a week's interval, and then about three weeks should be allowed for healing. Another good application is "iodized phenol."[†]

For severe forms of villous erosion, and for extensive cystic degeneration of the cervical canal, strong nitric acid is the best application. Recourse should also be had to the same caustic, if an erosion resists all milder remedies. While it produces a superficial eschar, its action is not deep, if it is not left very long in contact, and it does not usually produce much pain when applied to the cervix, though in some susceptible persons it evokes hyperæmia of the uterus, with reflex nervous symptoms, lasting for some days. The vagina should be protected, the swab of nitric acid should be kept in contact not more than a minute or two, and a large swab, freely soaked in water, should be applied afterwards. One application of nitric acid is often sufficient, and it should not generally be used more than two or three times, at intervals of about four weeks. It may be followed by the milder astringents, as styptic colloid or a solution of nitrate of silver.

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[*] Iodine, 75 grains; iodide of potassium, 90 grains; absolute alcohol, 1 ounce. Dr. Goodell recommends an application consisting of tannin 60 grains, and iodine 30 grains, or iodoform 120 grains, dissolved in an ounce of flexible collodion.

[†] Take of iodine, ʒss.; crystallized carbolic acid, ℥ij; water, ℥ij. Mix and combine by gentle heat. Use either pure or diluted with glycerine.

Next in value among the stronger caustics is a solution of chloride of zinc (gr. 300—450 ad ℥j.), but this must be used with caution, as it is capable of producing considerable destruction of tissue. The acid nitrate of mercury is used by some in place of nitric acid, but it does not appear to have any advantage over it, and has occasionally produced salivation in susceptible subjects. Marion Sims' favourite caustic for villous erosion was chromic acid, dissolved in an equal quantity of water. He applied a drop or two on a pointed glass rod to the granulations only. Unless its action is very carefully limited it is rather a painful caustic, and occasionally poisonous symptoms have been produced by its absorption when used freely. For the treatment of the same affection Schroeder recommended the repeated application of acetic acid, poured into a cylindrical speculum.

Astringent or mildly caustic liquids are used most conveniently through a Ferguson's speculum; and this plan is especially desirable when an application to the vagina for vaginitis is required at the same time. A teaspoonful or more of the fluid, enough to cover the cervix, is poured into the speculum, the patient being in the dorsal position. The speculum being moved about in different directions, the rugæ of the vagina are unfolded, any secretion retained in them evacuated, and the solution brought into contact with every part of the vaginal walls. It may then be introduced into the cervical canal by a Playfair's probe or sound very thinly wrapped with cotton, and passed up to the internal os. Solutions of sulphate of copper (gr. 40—60 ad ℥i.), of nitrate of silver (gr. 20—40 ad ℥i.), of protargol (gr. 30—60 ad ℥i.), and of chloride of zinc (gr. 90 ad ℥i.), are favourite ones for use in this manner. If nitrate of silver is used in this way care should be taken to protect the patient's linen from staining.

Some cases of glandular degeneration round the edge of the os, and in the cervical canal, may resist the action even of nitric acid. The choice then lies between the use of deeper caustics, as potassa cum calce, potassa fusa, the benzoline or actual cautery, and the scraping away the diseased glands with a sharp steel curette (Fig. 121), now made entirely of metal (Fig. 122). The latter appears generally preferable, as less likely to cause contraction or occlusion of the cervix, especially if there is occasion at the same time to curette the cervical canal or cavity of the uterus; but if the diseased condition is superficial, a single application of the benzoline cautery may suffice to cure. If the cautery is used it is best to apply it through a broad and short Ferguson's speculum of wood of the pattern shown in Fig. 28, p. 44. For the use of the curette or cautery to the outside of the cervix only, application of cocain solution beforehand may suffice, without the use of a general anæsthetic.

After the use of any of the stronger caustics it is a good plan to apply a tampon soaked in glycerine. Care should also be taken that contraction of the cervix does not arise; and, if necessary, a large metallic bougie should be occasionally passed. Occlusion has been produced by the repeated use of the solid nitrate of silver.

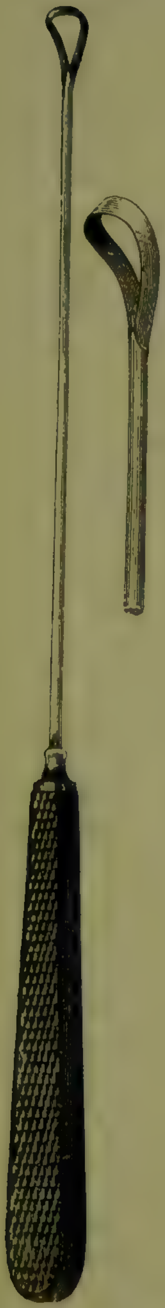

Fig. 121.—Sims' Curette.

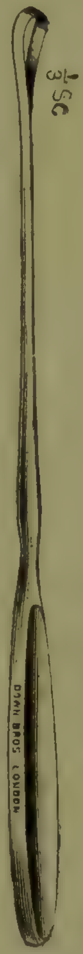

Fig. 122.—Sims' Curette with Metal Handle.

In the more chronic stages of cervical endometritis, the solid points of fused sulphate of zinc with alum are one of the most effective applications, but they are liable to cause a good deal of pain and irritation when any active hyperæmia is present.

They generally produce a slight superficial slough of the mucous membrane.

The zinc point may be held in forceps having a central groove in the blades, and passed into the cervix by the aid of a Sims' speculum. This method requires an assistant. Sometimes the uterus can be brought into a position of retroversion with the cervix low by a short bivalve speculum (*see* Fig. 29, p. 45), and then the zinc point can be passed in with forceps without an assistant. Otherwise, or if a Ferguson's speculum be used, it is difficult to do so without breaking it. The applicator shown in Fig. 123 is then useful. The piston is withdrawn till there is just room for the zinc point, and fixed by the screw. The applicator containing the zinc point is then passed like the uterine sound into the cervical canal for a distance of $1\frac{1}{4}$-in., a distance which should be marked by a transverse notch on the outside of the applicator. The terminal knob is then held steadily, the screw loosened, and the tube slipped down to the knob. The zinc point is thus left buried in the cervix.

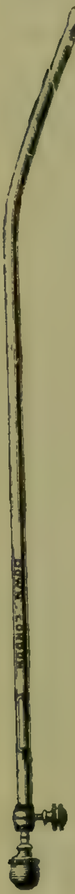

Fig. 123.—Tube for introducing Zinc Points into Uterus.

For the first time of application, at any rate, it is well to have the patient in bed, and to keep her in bed for a day or two afterwards. Milder applications may be made in the form of crayons containing tannin or other astringents, but these are usually less convenient than liquids.*

In some cases of cervical endometritis in nulliparous women, it is found that the os remains small, and the cervix has undergone little apparent change. Before local treatment can be satisfactorily used, the os must be dilated. This may be done by any of the methods previously described (*see* p. 52).

The inflammation of the whole thickness of the cervix, tending to hyperplasia, is little affected by internal remedies. At the stage when it is beginning to pass into induration, absorbents used locally may be of some service. A convenient application is iodized cotton, containing 20 per cent. of iodine.

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* Tannin may be made into a crayon with glycerine alone: tannin, gr. xxx.; glycerine, ♏iij. For other drugs, fifteen parts of the drug may be used to fifteen parts of powdered gelatine and two of glycerine. The gelatine is first moistened with water and then mixed with the glycerine in a water bath, the drug being afterwards added. The mass is then rolled out into crayons like a pill-mass.

A pledget of this is placed in contact with the cervix, and kept in position by a tampon soaked in glycerine. Iodide of potassium and iodine may also be used dissolved in glycerine or in the form of suppositories. The treatment of the resulting cervical enlargement has been already considered (*see* p. 156).

Treatment of Laceration and Ectropion of the Cervix.—After slight laceration of the cervix, any exposed cervical mucous membrane has its epithelium at length converted into the squamous variety, a process which may be accelerated by the use of astringents or caustics. If, however, there is deep bilateral laceration with eversion, or a triradiate laceration exposing the lining of the canal, this condition always remains a source of irritation and consequent hyperplasia, and the exposed mucous membrane is always liable to granular inflammation. The numerous occluded glands under the surface tend to keep up irritation and congestion, even if the cylindrical epithelium has been entirely converted into squamous. For these cases Dr. Emmet introduced the operation of *trachelorrhaphy*, or paring the edges of the laceration, and uniting them by sutures.

It has been estimated that as many as 30 per cent. of parous women have a laceration of the cervix, and an operation is not called for in all cases. It is unnecessary if the laceration is slight and not accompanied by eversion, hyperplasia, or inflammation; also in some cases, in which the exposed cervical mucous membrane has been completely covered with squamous epithelium, and there are no symptoms referable to the cervix.

But in all cases in which the laceration is combined with inflammatory conditions which call for treatment, in which there is adenomatous hypertrophy or granular inflammation of the exposed surface, especially if there is descent of the uterus or signs of reflex congestion of the fundus, a plastic operation is far superior to treatment by caustics. Not only is the cure by its means more rapid and certain, but the caustics leave a cicatricial tissue which is apt to break down, and adenomatous hypertrophy beneath the surface which may go on to form carcinoma.

Operation of Trachelorrhaphy.—Emmet and other authorities insist upon the necessity of preliminary treatment for three weeks or so by rest, hot douches, and glycerine tampons, to reduce congestion, and bring the tissues into a suitable condition for union. If the uterus is high up, and cannot be drawn down, the operation may be somewhat troublesome and tedious; but if the cervix can readily be drawn to the outlet of the vagina, the perineum being retracted by a very short Sims' or Simon's speculum, it is a very easy one. Care must be taken, however, not to use any undue traction, especially if there is any trace of a past cellulitis, such as is often associated with a deep laceration, for then there would be a risk of rekindling the inflammation.

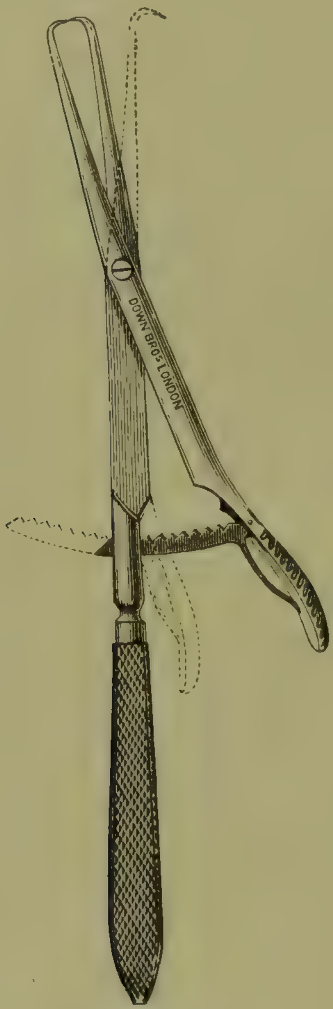

Fig. 124.
EMMET'S Uterine Tenaculum.

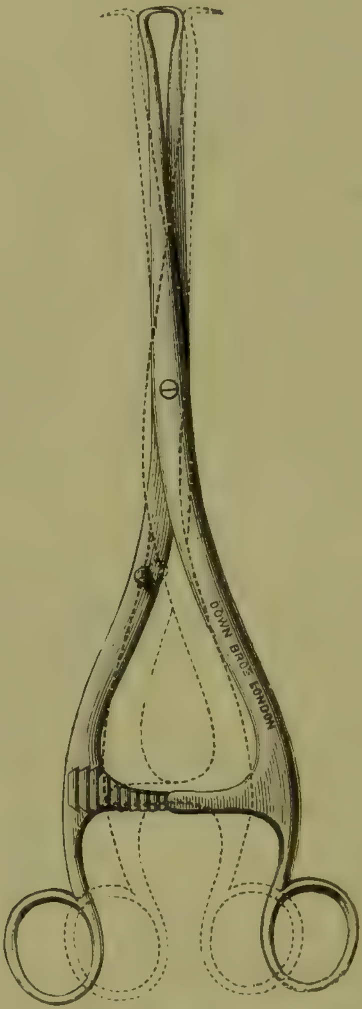

Fig. 125.
The AUTHOR'S Uterine Tenaculum.

Dr. Emmet uses a double tenaculum with diverging points (Fig. 124), introduced within the cervical canal, in order to steady the cervix. If, however, any considerable traction is employed, it is better to make it by means of vulsella fixed on the anterior or posterior lip of the cervix, for these are less likely to slip and cause laceration.

The tenaculum shown in Fig. 125, p. 216, may be used either, like Emmet's, as a diverging tenaculum, within the cervical canal, or a converging tenaculum, to seize one lip of the cervix. I have found the following the best mode of holding the cervix. Each lip is first seized with the tenaculum hook (Fig. 35, p. 49), and drawn into convergence with its fellow, in the position which it is to occupy when united. A firm hold of it can then be obtained with the double-pointed tenaculum (Fig. 26, p. 40), or, if the cervical canal is not very wide, with the single tenaculum (Fig. 125), which occupies less room. The other lip is secured in the same way. Each lip can then be drawn down and made to converge or diverge as desired.

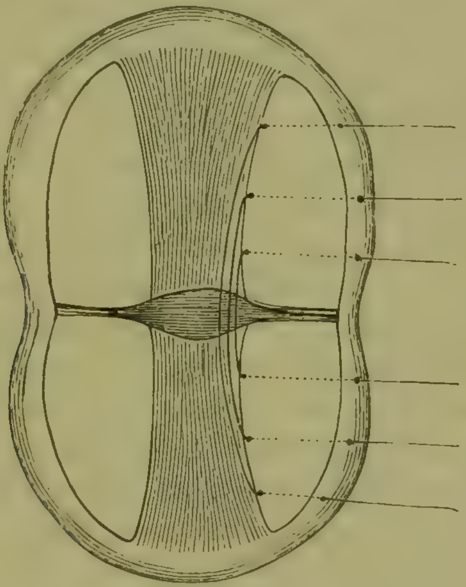

Fig. 126.
Lacerated Cervix, after denudation on both sides, and application of sutures on one side.

The operation may be carried out by placing the patient in Sims' semi-prone position, on the left side to freshen the right side of the cervix, and conversely. But it is more convenient to place her in the lithotomy or exaggerated lithotomy position, the legs secured by leg-rests or Clover's crutch (*see* Fig. 68, p. 80). The vulva should be shaved, and vagina and vulva disinfected. The cervix is drawn down to the vulva with the tenaculum on each lip, and the lips held somewha apart.

The mode of freshening the sides of the laceration and placing the sutures is shown in Fig. 126. The figure will be more readily understood if it is compared with Fig. 112, p. 201, representing the appearance of the laceration with granular inflammation. When the sutures are tightened, the two lips of the cervix, at the top and bottom of the figure, are brought into contact. In general, two or three sutures at each side are sufficient, but for a deep laceration four or five may be required. Dr. Emmet has introduced a "uterine tourniquet," in order to constrict the cervix during the operation. The hæmorrhage, however, is very rarely sufficient to call for any such expedient, and it is always arrested by tightening the sutures if the freshened surfaces are accurately adapted.

I have found a broad-bladed knife most convenient for freshening, the incision being made by the oblique part of the edge near the point. The tissue to be removed is seized by a vulsellum, such as that shown in Fig. 26, p. 40, and cut in one sweep from the apex of the triangle to its base, which lies at the angle of the laceration. The other side is treated in the same way, and finally the detachment is completed at the angle, the whole of the tissue being removed in one piece. Others mark out first the area to be denuded with the point of the scalpel, and then pare the surface with scalpel or scissors.

Another way is to transfix with a narrow-bladed knife near the angle of the laceration, and cut outward toward the apex of the triangle. The other side is treated in the same way, and finally the detachment completed at the angle. It is of essential importance to carry the freshening up to the extreme angle of the laceration, otherwise union will be prevented. If there is any difficulty about this—as, for instance, if the cervix cannot be drawn down fully to the vulva,—the parrot-beaked scissors (Fig. 96, p. 142) invented for the purpose by Dr. Stewart, of Brooklyn, may be used. In general, however, the desired dimensions of the flap can be mapped out more precisely with a scalpel. The freshened surfaces should be made as wide as practicable, consistently with leaving sufficient space for the cervical canal.

If the cervix cannot be drawn low enough to allow transfixing, the incisions may be made upwards toward the angle with a Sims' knife (Fig. 94, p. 140), the blade being set at right angles to the handle. In America scissors are more frequently used for the incision. The cervical canal should be left somewhat trumpet-shaped, as shown in the figure, to allow for some subsequent contraction of the os through diminution of the hyperplasia, and care must be taken not to leave any mucous membrane unfreshened at the extreme angles of the lacerations.

Emmet used silver wire, but the best material for the sutures is moderately stout silkworm gut. This has most of the advantages of silver wire, being perfectly unabsorbent, and is more convenient to manipulate. The sutures are best passed by Hagedorn's needles and needle-holder (Figs. 63, 64, p. 76), stout needles being chosen, the so-called gynæcological needles. If silkworm gut is used, the sutures may be fastened by Aveling's coil and shot (Fig. 127). The coil is made by winding silver wire very closely round a metal rod or stylet. The two ends of the sutures are passed first through a bead, then through the coil, and, when tightened, are fixed by a perforated shot. The suture is then removed with very great ease, for the coil being cut through with scissors just below the shot, and coil and bead being removed, the two ends of the suture are left projecting, and can be easily seized with forceps.

I have thought that the wire coil sometimes acts as a spring, and increases the tendency of the sutures to cut through. I have, therefore, abandoned it in favour of simple tying. The ends of each suture are left long and tied together, the suture being tucked up in the vagina. For removal no anæsthetic is necessary unless a patient is extremely hyperæsthetic. Sims' semi-prone position is employed, and a short Sims' speculum, the patient being on a couch close to a window or other good light. The sutures are brought outside the vagina, and the cervix drawn down by their means. Then each suture is drawn upon, till the tip of sharp-pointed scissors can be passed underneath the knot and the suture divided.

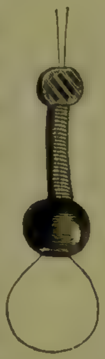

Fig. 127.
AVELING's Coil and Shot.

The sutures should not be removed under ten days, and it does no harm to leave them up to fourteen. They should be taken out from above downward. If any tendency to separation appears, the lower sutures may then be left two or three days longer. In cases of laceration limited to one side, the operation need be performed on the one side only.

Trachelorrhaphy answers best when it is performed within a year or two of the laceration, when no caustic applications have been made, and before the cervix has become indurated in its deformed shape from chronic inflammation. The natural shape of the cervix can then be restored, and the cervical lining which had been exposed regains its normal character. In lacerations of longer duration, a prominence is formed in the centre of each lip of hypertrophied and indurated tissue, which is the more indurated if treatment by caustic has been employed. This central prominence tends to resist the approximation of the lips. In extreme cases it may cause so much tension upon the sutures that they cut through; and thus union may fail, or only a thin surface of union be obtained, or a certain amount of eversion may still remain after the union. Even if perfect union be obtained, a good deal of adenomatous hypertrophy remains on the inner surfaces of the lips.

Schroeder's Operation.—Schroeder's operation is designed to meet cases of this kind, especially if it is impossible, by drawing the lips together by two sharp hooks, to make the whole of the granular surface, or adenomatous hypertrophy, disappear. It consists of cutting a transverse wedge out of each lip of the cervix, and closing the gap by sutures. If the cervix is not already deeply lacerated, a transverse incision is made at the angle on both sides, or on one side in the case of unilateral laceration, so as to allow the lips to be completely separated, and the inflamed or degenerated surface within exposed.

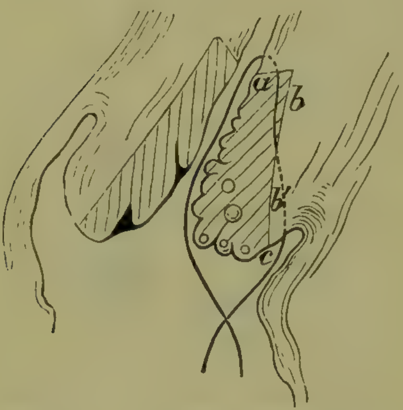

Fig. 128.—Schroeder's Operation for Excision of Cervical Mucous Membrane.

The mode of making the incisions and applying the sutures is shown in Fig. 128. At the base of each lip, toward the cervical canal, a transverse incision, *a b*, is made completely through the thickness of the mucous membrane, slanting somewhat upward. This is joined by another incision, *c b*, made from without, so that the whole of the granular surface and hypertrophied adenomatous tissue is removed in the wedge-shaped piece. Sutures are then passed as shown in the figure, so that the point *c* is brought to *a*, and *b′* to *b*. This implies an infolding of the longer arm of the V. By this operation the vaginal portion of the cervix is naturally much shortened, and the resulting cervix projects very slightly into the vagina.

Author's Operation for Cervical Laceration.—In the majority of cases of laceration of any long standing, with eversion of the lips of the cervix, and some hyperplasia of the centre of each lip, I have found an operation give the best results which is intended to combine the effects of trachelorrhaphy and Schroeder's operation.

The cervix should first be moderately dilated, up to the size of

Hegar's dilator No. 10 to No. 12. In most cases it is advisable to curette the fundus as a preliminary measure; and, in any case, the lining of the cervix should be thoroughly curetted, but no caustic is to be employed. Any projecting ridges on the lining of the cervix may be levelled by snipping them off with sharp-pointed scissors.

The patient is placed in the lithotomy or exaggerated lithotomy position, and the legs secured with leg-rests. The cervix is drawn down to the vulva, and a vulsellum fixed upon one lip holds it in place while the plastic operation is performed upon the other. Then the vulsellum is shifted, and the second lip treated.

First, a wedge-shaped portion of tissue is excised from each lip, as in Schroeder's operation, but without any lateral incisions being made. The inner arm of the V-shaped incision is not carried quite so high up the cervical canal as in Schroeder's operation (*see a b*, Fig. 128), but the V is made deeper, and its arms more nearly equal. In Fig. 129 the lines of incision are shown on the posterior (lower) lip; on the anterior (upper) lip the wedge of tissue is shown as removed, and the sutures applied. The line of incision, A B C, passes well outside all granular surface, glandular tissue, or Nabothian glands. The wedge of tissue, A B C, is seized by a double-pointed vulsellum forceps (Fig. 26, p. 40), pinching it up in an antero-posterior direction The incision is then made by a scalpel, first along A C, then

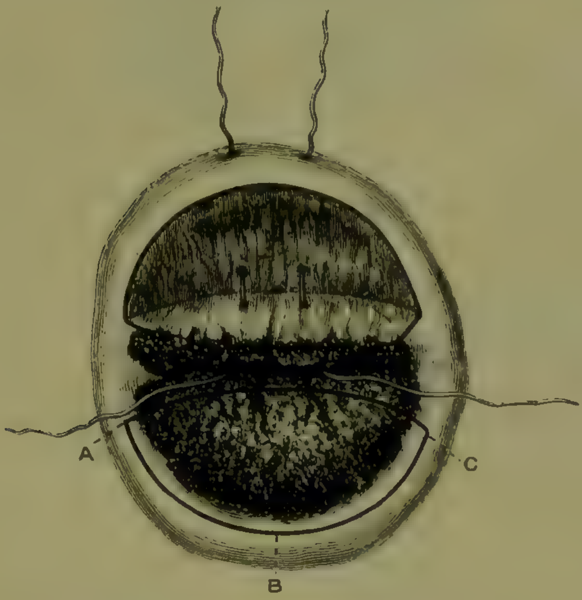

Fig. 129.
The AUTHOR'S Operation for Lacerated Cervix. First stage.

along A B C, so as to remove the wedge. The sutures are of fairly stout fishing-gut, and are applied with Hagedorn's needle-holder and needles. At the outer part of the cervix the needle should pierce the cervical mucous membrane at some distance from the edge, about one-third inch, in order to ensure that the flap is sufficiently inverted when the sutures are tied

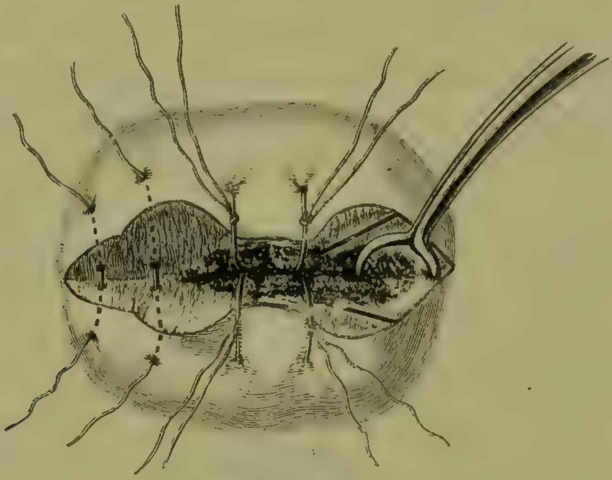

Fig. 130.—The AUTHOR'S Operation for Lacerated Cervix. Second stage.

When both lips have been thus treated, and the sutures tied, the original angles of the laceration will remain, and some granular surface in their neighbourhood, between the lateral angles, at each side of the wedges which have been removed (*see* Fig. 130). The angle of the laceration is then seized by a single-pointed tenaculum, and freshened by excising another wedge. The form of tenaculum shown in Fig. 125. p. 216, will answer for this purpose; or the curved tenaculum shown in Fig. 130, which is one designed by Dr. Stewart, of Brooklyn, for seizing the centres of the two lips of the cervix in trachelorrhaphy.

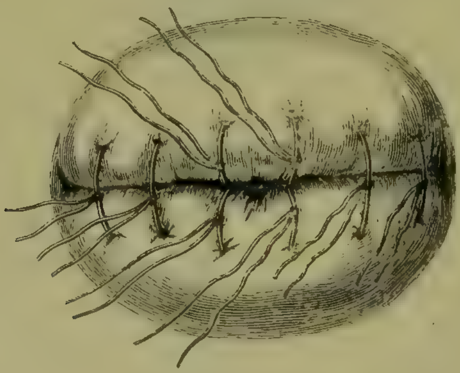

Fig. 131.—The AUTHOR'S Operation for Lacerated Cervix. Completed.

In Fig. 130 the lines marking out the lateral wedge to be excised are shown on the right-hand side of the figure, and on the left-hand side the wedge is shown removed, and the sutures applied to close the lateral angle. These also should pierce the mucous membrane about a quarter or a third of an inch from the margin, to secure the close approximation of the edges. When the sutures have been applied and tied at both sides, the effect is not only to close the lacerated angles of the cervix, but to invert still further the centres of both lips. Thus any remnant of lining mucous membrane which was still visible, as shown in Fig. 130, becomes hidden in the cervical canal, and the final appearance of the cervix is as shown in Fig. 131. In general two sutures are sufficient for each lip, and two for each angle, eight in all. Occasionally one or two more are wanted to complete the adaptation of the intermediate corners, at the sides of the new cervical canal, between the central and lateral sets of sutures.

The sutures are left long, the ends of each suture tied together, and all are tucked up into the vagina. At the end of from ten to fourteen days they are removed by the aid of Sims' speculum and the semi-prone position. in the manner described at p. 219.

If, on account of fixation of the uterus by cellulitic thickening, or for any other reason, it is decided not to operate, and there is inflammation of the exposed cervical mucous membrane, the object will be to hasten the conversion of the epithelium into the squamous variety. For this purpose one or two applications may be made, in the first instance, of one of the stronger caustics, such as nitric acid, the benzoline cautery, or even potassa fusa cum calce, or potassa fusa.

SYPHILITIC ULCERATION OF THE CERVIX.—Primary chancre may occur on the cervix, but is very rare in this situation. The ulcer is marked by sharply-cut, indurated edges, depressed surface, and a tendency to become covered with false membrane. Mucous patches on the cervix are also rare, as is tertiary syphilitic ulceration. The latter forms an excavated ulcer which readily bleeds, and is apt to be mistaken for an early stage of cancer. It is not generally accompanied by so much pain or so great fœtor in the discharge, but the history of constitutional syphilis will guide much in the diagnosis. Syphilitic ulceration has occasionally even laid open the rectum or bladder. It is generally distinguished from simple erosion by its not being close to the os, in continuity with an inflamed cervical canal, but separated from the os by a bridge of intact tissue.

CHRONIC ENDOMETRITIS AND CHRONIC METRITIS.

Pathological Anatomy.—Chronic endometritis proper, or chronic corporeal endometritis, consists of inflammation of the mucous membrane of the body of the uterus. The inflammation is not absolutely limited to the mucous membrane, but extends to some extent, slight or considerable, into the substance of the organ (*see* p. 162), and is accompanied by more or less active hyperæmia of the whole uterus. Endometritis and metritis are therefore not separate affections, but the terms may be used respectively to indicate the preponderance of the disease of the mucous membrane, or that of the parenchyma, in different cases. Endometritis and metritis are frequently associated with subinvolution, of which they are often the cause, and with the effects of passive hyperæmia, which renders the tissue more vulnerable to irritating causes.

Since the mucous membrane of the uterus consists of a very embryonic form of cellular tissue, which is constantly undergoing nutritive changes during the menstrual cycle, and is subject to physiological congestions both menstrual and sexual, it is difficult to draw the line between inflammation and excess of physiological congestion on the one hand, or hyperplasia with fibroid degeneration on the other.

Microbes which may be the cause of acute endometritis are comparatively rarely to be demonstrated in the conditions described as chronic endometritis or chronic metritis. The gonococcus is the most likely to persist long in the cavity of the uterus ; but in some forms of chronic purulent endometritis, such as senile endometritis, septic microbes may be present. More often, even if the disease has commenced as an acute endometritis from gonorrhœa, septic infection, or zymotic disease, under which title many so-called "colds" must be included, the microbes die out, but changes in the nutrition of the tissue remain, of the nature of hyperplasia, or degeneration, or both. In other cases the inflammation may never have been microbic at all, but have originated from a traumatic cause, the effect of some toxin circulating in the blood, or from nerve influence. Thus, in a considerable proportion of cases generally included in the term chronic endometritis or chronic metritis, the histological characters do not indicate an active process of inflammation, but rather its effects, in the form either of adenomatous hypertrophy or fibroid hyperplasia of the stroma. Some authorities deny to these conditions the title of endometritis, and hence arises the difference of opinion as to whether the disease is a common one.

In more recent cases, however, not very far removed from a subacute form of the disease, the stroma shows œdematous swelling, infiltration with round inflammatory cells, and sometimes blood corpuscles. These conditions extend, to some degree, to the adjacent muscular wall. The glands may be dilated, more tortuous than usual, the epithelium altered in character, sometimes irregularly filling the gland cavity, instead of being arranged in orderly manner around a lumen. The epithelium on the free surface also becomes deformed and irregular.

In chronic forms of inflammation the most marked feature is excess of fibroid tissue, the so-called areolar hyperplasia, throughout the whole muscular wall. The mucous membrane may show adenomatous hypertrophy, or, in long-standing cases, atrophy and degeneration.

In slight catarrhal forms of endometritis there is presumably no alteration of structure of the stroma or muscular wall beyond congestion, and the only change is in the secretion, which may be excessive or may become turbid or muco-purulent. Sometimes it is brown or rusty from slight admixture of blood, or more distinctly sanguineous. Naturally, the opportunity of examining the whole uterus does not occur in such cases, but scrapings of mucous membrane removed by the curette often show dilatation of glands, and alteration of their epithelium.

The parenchyma is most involved in those cases which originate in the more acute forms of inflammation, septic or otherwise, of the whole substance of the uterus, especially those which originate after labour or abortion. Even when the disease does not immediately follow upon parturition, but originates in catarrhal inflammation of the mucous membrane at a later period, after involution is complete, it tends to involve the parenchyma more in the parous than in the nulliparous uterus, on account of the looser texture of the uterine walls. In the early stage of chronic metritis the tissue is soft, red, swollen, and succulent, from infiltration of serum, and therefore prone to flexion. The uterus becomes enlarged, even when not already large from the effect of subinvolution, but the enlargement is more in the thickness of its walls than in its length, especially in the nulliparous uterus. At a later stage the tissue is indurated by growth of connective tissue, and the state of hyperplasia, which has already been described (p. 149), is reached. Some degree of degeneration of tissue may arise from passive hyperæmia; but, in the absence of any cause of venous obstruction, the degree of fibroid induration may be taken as a measure of the degree to which inflammation has extended through the parenchyma. In the majority of cases, especially in the parous uterus, the cervix as well as the body is involved in chronic metritis.

The following special forms of endometritis are described:—

Fungoid or Hæmorrhagic Endometritis.—This is histologically diffused adenomatous hypertrophy of the mucous membrane, rather than inflammation, but it appears to arise out of chronic catarrh. Some propose to call it adenoma rather than endometritis; but it is to be distinguished from adenoma in the form of a localized non-malignant tumour of the uterus, which sometimes, though very rarely, occurs.

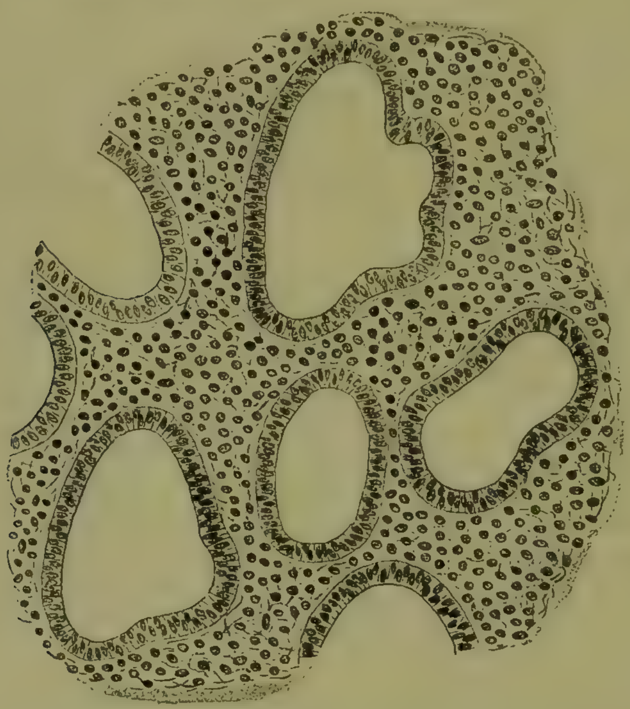

Fig. 132.
Section of a Prominence in Fungoid Endometritis.

In hæmorrhagic endometritis there may be simply adenomatous hypertrophy of the whole mucous membrane, with a more or less irregular surface, or there may be outgrowths or polypoid projections, which are specially apt to form near the extreme fundus. The structure of the outgrowths and of the general hyperplasia is the same, and is shown in Fig. 132. It consists of proliferating glands with a stroma intervening resembling that of the normal mucous membrane, but more actively growing. The glands are dilated, convoluted, and may be branching, with processes projecting into their cavity, but the epithelium is regular and does not infect the stroma; nor are there any clusters of epithelium-like cells detached in the stroma. It is by this character that the condition is mainly distinguished from commencing glandular carcinoma.

In most cases the stroma forms a large proportion to the glands, as shown in Fig. 132; and there is then no indication of a tendency to malignancy. In rare cases a malignant adenoma is found, in which there is no infection of the stroma by epithelial cells, but the indication of malignancy consists in the almost entire absence of any stroma, while the glands are proliferating in extreme degree, and form a friable tissue.

There are some cases of fungoid endometritis in which the glands are proliferating much more exuberantly than in that shown in Fig. 132, and the stroma is very scanty in proportion. There are others, again, in which the gland epithelium in places is not distinctly defined as separate from the stroma, and appears to show a tendency to invade it. Such characters give occasion to a suspicion of a tendency to malignancy, and it appears that carcinoma of the fundus, which is generally glandular in type, originates out of adenomatous hypertrophy.

The chief characteristic of fungoid endometritis is its tendency to cause bleeding. In accordance with this, the stroma is generally much looser than in the normal mucous membrane, and is often infiltrated with blood cells. There may be tracts of clot, where the tissue has been separated by effusion of blood into it. The surface is usually covered in most places with a more or less intact cylindrical epithelium.

Atrophic Endometritis.—In atrophic endometritis the mucous membrane is thinner than normal, and the glands ill-formed or scanty. There is often an undue proportion of fibrillar tissue in the stroma, and menstruation is usually scanty. The mucous membrane is often infiltrated with blood cells. It may contain microbes and produce a purulent secretion, the normal power of resistance to microbes being diminished. In this case the surface epithelium is likely to be absent or defective.

Atrophic endometritis is more often found in older women than in the young, and is especially associated with chronic induration of the whole uterus by areolar hyperplasia. It may be the result of the use of strong caustics, which have damaged the endometrium beyond its natural power of reproduction.

Senile Endometritis.—This is a form of atrophic endometritis which occurs in women past the menopause, and especially in those approaching old age. Its special characters are the tendency of the discharge to become purulent and often offensive. This appears to depend upon two factors, the diminished resisting power of the atrophied mucous membrane and its secretion to the invasion of microbes, and the diminished contractile power of the senile uterus. From the latter it results that the uterus more readily allows some secretion to be retained within it, and thus a nidus for multiplication of microbes is preserved. The microbes concerned may be both septic and saprophytic.

Pyometra.—Pyometra, or the distension of uterus with pus, generally implies some obstruction to the outflow from the uterus, with infection of the interior. Its most frequent cause is cancer of the cervix or cervical canal in old women. This may block or partially obstruct the canal, but I have met with a case in which there was no apparent obstruction. The microbes which flourish in the sloughing cancer infect the endometrium, and lead to the production of offensive pus. In other cases, pyometra has resulted from the partial obstruction of the uterine canal by a fibroid tumour, or from a stricture the result of operation, as after supra-vaginal amputation of the cervix for carcinoma. It may arise also from tubercle of the endometrium.

In some cases of senile endometritis, a slight cause of obstruction of the canal, such as a retroflexion or a stenosis from adhesive inflammation of the cervix, leads to distension of the uterus with offensive pus. I have found such a distension to the extent of several drachms even with a quite free and rather patent cervical canal. The pus may be sanguineous, and then the presence of an offensive and sanguineous discharge may lead to the suspicion of cancer of the fundus.

Pyometra may arise from any malformation or acquired atresia causing retention of menses, if the septum has ruptured by a small opening, or if there is a natural small opening leading to the exterior. I have met with it in the case of a septate uterus and vagina, the vagina imperforate on one side, and with a small opening in the septum of the uterus. The retained menstrual fluid decomposes, and is eventually converted into or replaced by pus.

Physometra, or distension of the uterus with gas, has chiefly been observed in septic puerperal infection of the uterus. It has also occurred as a rare complication of pyometra due to sloughing fibroids or cancer of the cervix. The production of gas is attributed to the *Bacillus capsulatus aerogenes*, a large straight bacillus, with rounded ends, from three to six μ in length. It has a distinct capsule, and grows singly or in chains of three or four.

Causation.—Constitutional tendency plays some part as a predisposing cause of chronic endometritis. Those specially liable to catarrhs of mucous membrane in general, or who do not recover readily from such catarrhs, as is often the case with those disposed to tuberculosis, are most likely to suffer from it. The tendency is increased by chlorosis and other forms of anæmia, or by any other form of malnutrition, as well as by mental depression.

The chronic form of endometritis may be a sequel of any of the microbic infections already described, either with or without the persistence of the microbes. Of these the gonococcus is most likely to maintain a prolonged existence. Winckel classifies those forms of endometritis which are due to microbes as gonorrhœal, tubercular, septic, saprophytic, syphilitic, endometritis due to fungi, endometritis due to amœbæ.

Forms of endometritis not directly dependent upon microbes may result from general toxins, such as those of rheumatism, gout, or other digestive toxins. Of those resulting from zymotic diseases, including influenza, it is not ascertained how far they are due directly to the microbes of the disease or their toxins. An instance in which the former was the case, as regards influenza, has been already mentioned (*see* p. 173).

A part of some importance is also played by syphilis, which specially affects the developing mucous membrane in pregnancy, and so leads to abortion or miscarriage, or adhesion of the placenta at full term. After any of these events the endometrium is apt to be left unhealthy; and, especially after abortion, fungoid endometritis is apt to occur, and to give rise to recurrent hæmorrhages, although the whole of the ovum may have been evacuated. Abortion from other causes may also lead to similar effects. Apart from abortion, endometritis is common in syphilitic subjects, though it presents no distinctive signs. When the disease is recent and active, the leucorrhœal discharge may convey the contagion.

Endometritis is often ascribed to the effect of cold, especially at a menstrual period. Some authorities are sceptical about this causation, but there is no valid ground for disputing it, although the exact mode of operation is not fully understood. The effect of cold may depress the action of vital organs, and lead to the production or retention of some toxin. It may render the whole organism liable to the invasion of the influenza bacillus, or other microbe as yet undiscovered, and the microbe or its toxin may act upon the uterus. It may depress the vitality of the uterus, and render it subject to inflammation, due to microbes present in the vagina or cervix, but otherwise non-pathogenic. This is the saprophytic endometritis of Winckel. I have met with chronic forms of purulent or muco-purulent uterine catarrh in which the uterine discharge contained abundantly a mixture of two or more peculiar forms of bacilli, which are probably ordinarily saprophytes.

Sexual excess may be a cause of endometritis, as well as of ovarian inflammation, either through a direct traumatic effect upon the uterus, or through excessive frequency of the congestion of sexual excitement. It is often a doubtful point how far the latter passes the boundary between congestion and inflammation. But it is capable at any rate of causing tenderness and pain, and leading to nutritive changes of the nature of hyperplasia, similar to those resulting from chronic inflammation. And general pathology, especially the occurrence of such diseases as herpes zoster, abundantly proves that nerve influence may lead to actual inflammation.

As regards sexual excess, there is a difference between the sexes. The sexual orgasm in the female is not an end in itself, as in the male, but its physiological function appears to be to determine the orgasm of the male. Hence it is capable of easy repetition, if this effect is not produced on the first occasion, while it involves much less expenditure of nervous energy than in the male. Consequently, in susceptible women, the sexual orgasm is capable of almost indefinite repetition, especially if the excitement is of an artificial kind. Thus, while a given degree of sexual excess is less exhausting than in men, a far greater degree of excess is possible in women. This is capable of causing severe neurasthenia. But, as a general rule, as compared with men, sexual excess in women has more tendency to produce local troubles, and less to cause nervous exhaustion. Harm resulting from masturbation is generally produced in this way, rather than from traumatism, the act being usually effected by external titillation of the clitoris. Apart from excess, masturbation is in adults no more physically injurious than coitus, but excess is more likely in the absence of the natural limit imposed by fatigue.

More often the sexual excess is that of a too vigorous husband, especially at the outset of married life. If the wife is herself sexually apathetic, she is more likely to suffer, partly because the natural lubricating secretion, abundantly poured out from the vulvo-vaginal glands under the influence of sexual excitement, is then wanting. Any retroversion or retroflexion of uterus, especially if associated with descent, renders it more liable to traumatism in coitus Women who lead an immoral life suffer from traumatic effects as well as from contagion.

Considerable importance is attached by some authorities to the use of preventives of pregnancy, and especially to the method of withdrawal, as a cause of uterine and ovarian congestion, leading to some of the conditions included in the terms chronic endometritis and chronic metritis. This method may interfere with the sexual orgasm on the part of the wife, and its natural sedative effect, and thus lead to a prolonged irritation of the nervous system, as well as local congestion. In women who are impassive sexually, and do not experience the orgasm in coitus, it can scarcely make any more difference than any other cause of sterility. The effects of it have thus perhaps been somewhat exaggerated, but doubtless it is more salutary for health not to interfere with the course of nature as regards pregnancy.

Not only sexual excess, but celibacy may be a predisposing cause to uterine congestion and endometritis. Women are doubtless intended by nature to bear children before menstruation has continued for very many years. Those who do so are generally comparatively free from dysmenorrhœa afterwards. But if menstruation continues uninterrupted by pregnancy, symptoms of congestive dysmenorrhœa are apt to arise after a time, and the endometrium to become morbid, though its condition may not be actually one of inflammation. Mental effects of disappointment may also have an influence. Thus, while there is a first period of life at which pelvic troubles are apt to commence in unmarried women, namely, when they begin to wear long dresses and to tighten their corsets, there is a second when they approach the age of twenty-eight or twenty-nine, and begin to fear that they may perhaps never be married.

Endometritis is often observed in conjunction with some obstacle to the cervical canal, as from stenosis or flexion, especially in patients who suffer from dysmenorrhœa. While it does not appear that such obstacle can by itself set up inflammation, yet the retention of secretion within the cavity of the uterus aids the proliferation of any microbes which may be associated with the inflammation, and thus retards recovery from any casual catarrh which may have arisen from cold or any other cause. This effect is increased if the menstrual blood forms clots within the uterus, from not escaping quickly enough into the vagina; or if shreds of menstrual decidua are detained.

Fibroid tumours, when they interfere with the passage of secretion through the cervical canal, or the contractions of the uterus, promote endometritis in a similar way. Sometimes sloughing and septic infection of the fibroids is brought about in consequence. Apart from any microbic inflammation, fibroid tumours are often associated with adenomatous hypertrophy of the mucous membrane, identical with that described as fungoid or hæmorrhagic endometritis. This is the cause of the metrorrhagia, when that symptom is associated with fibroids.

Inflammation of the cervix, extending from the vagina, is more likely to affect also the body of the uterus, the more acute is its character. This is especially likely, therefore, to take place in the case of gonorrhœa, although a non-specific inflammation may occur, so acute as to be indistinguishable from it. The foundation of chronic endometritis and metritis is often laid at the commencement of married life, and though this may result simply from marital imprudence, yet gonorrhœal contagion is not an infrequent cause. Dr. Noeggerath, of New York, has maintained that gonorrhœa, in both sexes, persists for life in certain sections of the organs of generation, notwithstanding its apparent cure; that this "latent gonorrhœa" may affect a healthy person either with an acute attack, or with a similar chronic inflammation, which, in women, is apt to lead not only to chronic endometritis, but to ovaritis, pelvic peritonitis, or even puerperal septicæmia. He also regards this infection from latent gonorrhœa as the commonest cause of sterility. It can scarcely be doubted that this view as to the incurability of gonorrhœa is greatly exaggerated. But it appears to be the fact that a latent gonorrhœa or gleet in the husband very frequently infects the newly married wife with an inflammation which is not acute enough for its nature to be obvious, but is yet the starting point of chronic endometritis, and consequent sterility.

Results and Symptoms.—The most constant symptom of corporeal endometritis is leucorrhœa. The discharge is of a less tenacious character than that secreted by the cervix, and is more frequently muco-purulent. Sometimes it has an irritating effect upon the vagina and vulva, and leads to reddening of the vagina, most marked at its upper part around the cervix, or to excoriations of the vulva and adjoining skin.

In most cases of the ordinary uterine leucorrhœa, it is difficult to determine what part the fundus and cervix respectively take in the production of the discharge. I am disposed to think that more of the secretion comes from the fundus than has generally been supposed; since I have found that, after supra-vaginal hysterectomy, patients are rarely troubled by leucorrhœa. The discharge may collect for a time in the uterus, and be expelled occasionally, leading the patient to imagine that an internal abscess has burst.

When endometritis is not limited to the cervix, but affects the body of the uterus, some menstrual disturbance is almost invariable. In the early stages the flow is usually profuse, painful, and often irregular, and is followed for some days by an excess of leucorrhœal discharge, which is often rusty from slight admixture of blood. Hæmorrhagic discharges in the intervals are not uncommon.

Of fungoid or hæmorrhagic endometritis the characteristic symptom is continuous or irregular metrorrhagia. The periods may be profuse, or the patient may lose count of them altogether. In atrophic endometritis, menstruation is scanty, and the discharge more apt to be purulent or muco-purulent. In senile endometritis the discharge is generally purulent and often offensive, and may be tinged with blood.

In the later stages of endometritis, when, with general induration of the whole uterus, there is degeneration of the mucous membrane, menstruation becomes scanty, and generally painful. Sterility is a common result at all stages, from the destructive effect of the altered secretion upon the spermatozoa, or from the mucous membrane having ceased to form a suitable nidus for the ovum. If pregnancy happens, the previous endometritis may merge into a decidual endometritis. Hence may arise decidual or placental hæmorrhages, abortion, or adhesion of the placenta at full term.

A frequent symptom of endometritis of slight degree, especially as it occurs in unmarried women, is dysmenorrhœa of the congestive type, and referable to the uterus. In the intervals of menstruation there may be no pain, or there may be some backache, referred to the upper part of the sacrum. The menstrual pain may begin only with the flow, but frequently begins some days beforehand, and is usually increased with the flow, disappearing perhaps after a day or two, or before the flow has ceased. The pain is central, felt in the front, or both in front and back. It is more or less continuous; or, if intermittent, the duration of the pain is longer than could correspond to uterine contractions, often several hours. The pain may be severe enough to lead to nausea or vomiting; but, as a rule, is not so intense as the spasmodic pain attributed to uterine contraction.

In such cases there is generally leucorrhœa in the interval, or at any rate before and after the period. The uterus is often slightly enlarged, as measured by the sound, and there may be a catarrhal patch of granular inflammation near the os. The fundus uteri is often found tender, though not painful, even in the interval, and intensely tender if examined during a period.

The more prominent general symptoms of endometritis of a more marked degree depend upon the whole parenchyma of the uterus being affected by reflex hyperæmia, or more or less involved by extension of inflammation to the deeper tissues. They vary greatly in intensity, according to the degree of such extension and the susceptibility of the patient to reflex nervous disturbance. Dragging pain is felt in the hypogastrium and groins, often extending down the thighs, and also in the back, generally at a somewhat higher level than in affections of the cervix—that is to say, over the upper part of the sacrum or last lumbar vertebra. The pain is frequently most acute in one groin, generally the left—a circumstance sometimes, but by no means always, explained by the participation of the ovary on that side in hyperæmia or inflammation. There is usually tenderness on pressure over the situation of the uterus.

Pain is greatly increased by locomotion or coitus, and the latter often leads to an aggravation of distress of considerable duration. More or less disturbance of the functions of bladder and rectum is generally produced. There is pain in micturition and defæcation, from the pressure upon the tender uterus produced in any bearing-down effort, and frequently also irritability of bladder. Sometimes there is diarrhœa, from a similarly irritable condition of rectum, but more frequently constipation, arising, in great measure, from the reluctance of the patient to make any effort.

Numerous other general symptoms are more or less directly connected with uterine disease, and gynæcologists have been accused of claiming too much importance for the local condition as a cause of such disturbances. It would obviously be erroneous hastily to assume that any nervous affection or digestive disturbance in a woman was dependent upon the uterus or ovaries, in the absence of local symptoms pointing to such a cause. On the other hand, a reflex symptom may be the subject of much more complaint than symptoms directly connected with the primary cause, especially when the latter are of a nature which women often do not mention until cross-examined on the subject. Reflex symptoms are not necessarily proportional to the intensity either of the local disease or of the local symptoms, but depend much more upon the susceptibility of the nervous centres. This is proved by such familiar instances as the vomiting of pregnancy, which may occur when there is no local distress and pregnancy is quite unsuspected, or as an attack of asthma produced by a late supper, or a headache due to irritating material in the alimentary canal, and relieved at once by a purgative. I have known the so-called hysterical knee-joint to be complained of by a neurotic woman during the few days preceding menstruation on each occasion, and at no other time, although there were no local symptoms in the pelvis. In this case the relation to the uterine system could not have been proved except by the coincidence in time. In an individual case it may be a matter of extreme difficulty to decide whether a given symptom is reflex; and the only hope of solution will sometimes lie in the therapeutic test of treating the uterine or ovarian disorder, if evidence is found of the existence of one.

No one can doubt that chronic endometritis or metritis is capable of producing such reflex symptoms as pain in the dorsal, lumbar, or sacral regions, or extending down the thighs and legs; pain in the course of the ilio-hypogastric or ilio-inguinal nerves, not necessarily dependent upon any inflammatory change in the ovary; also pain and irritability in the bladder or rectum. To these may be added pruritus of the vagina or vulva, vaginismus, and pain and tenderness in the coccyx, apart from any inflammatory lesion of that structure: all which symptoms may arise through reflex hyperæsthesia. These pains are liable to exacerbations at or near menstrual periods, or from the effects of coitus, as well as from general causes, such as exertion or the effect of cold.

As might be expected from the close sympathetic connection between the breasts and the uterus, the breasts may be affected by uterine disturbance. Neuralgic pain in the nipples or glands is not uncommon about the time of the maximum development and congestion of the uterine mucous membrane, shortly before the onset of the menstrual flow, especially in conjunction with dysmenorrhœa. In cases of chronic endometritis or metritis, the glands sometimes become enlarged, containing a mucoid secretion, and their areolæ darkened, so that a patient may often imagine herself to be pregnant, especially when tympanitic distension of the abdomen is present.

Histological researches have shown that the type of scirrhous cancer of the breast corresponds to a condition which is normal at the very earliest stage of the natural evolution of the breast in pregnancy, at which stage it is the normal destiny of the epithelial cells of the acini to pass into the connective tissue stroma.* Hence it appears probable that a similar abnormal stimulus to gland activity, very protracted, but of a still lower intensity than that which evokes a mucoid secretion, may be a predisposing cause of cancer of the breast, not having a traumatic origin; and clinical experience appears to give some support to this view.

In a similar way, reflex influence may have something to do with other forms of growth in the breast. I have known a considerable fibro-adenoma of long standing disappear completely within a few months after removal by hysterectomy of a fibroid uterus, the ovaries not being removed.

The close nervous connection of the stomach and other digestive organs with the uterus is equally undeniable, and is demonstrated by the vomiting and other digestive disturbances of pregnancy. Sexual excitement may produce nausea or even vomiting, when congestion or inflammation of uterus or ovaries exists. Also, in chronic congestion or inflammation of the uterus, flatulent distension of the abdomen, eructation, nausea, and vomiting are frequent results, especially in hysterical subjects, and more or less dyspepsia is almost invariably produced. The effects of ovarian irritation are very similar, and both are explained, on anatomical grounds, by the connection of the sympathetic nerve supply of the upper part of the uterus with the ovarian plexus, and through this with the upper aortic and

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* See Dr. C. Creighton's work, "Contributions to the Physiology and Pathology of the Breast."

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renal, and so with the solar plexus. In accordance with physiological doctrine, irritation of the sympathetic system inhibits the secretion of gastric juice and other digestive fluids; and hence arises failure of digestion, and fermentation of the food, by which catarrhal gastritis and enteritis may be subsequently set up. The failure of nutrition thus brought about is a prominent symptom of uterine or ovarian disorder, which in this way may be, in predisposed subjects, the starting point of phthisis.

Other general results of uterine disease are of a more indirect kind. The local malady may affect the general health, not only by its adverse influence on the digestion, but by interfering with locomotion. Owing to the pain produced by movement, the patient is deterred from obtaining sufficient air and exercise to fulfil the hygienic requirements for healthy life. It is often doubtful whether distant effects are produced in this way, or directly by reflex nervous influence, and probably, in many cases, both modes of causation are more or less combined. Among the symptoms common in patients suffering from chronic uterine inflammation are neuralgic pains in various localities, as along the edges of the false ribs, but more especially at the top of the head or under the left breast, the last form of pain being often accompanied with palpitation. This infra-mammary pain would seem to have a direct nervous association with the tendency to pain in the left groin, rather than the right, and with the greater frequency of congestion and swelling in the left ovary. Other reflex neuroses are occasionally produced, such as asthma, or catarrh of the fauces or air-passages; but in individual cases of this kind the link of causation is very difficult to establish, unless it is proved either by a relation to menstruation, or by the effect of local treatment directed to the uterus, or of the intervention of pregnancy.

Various changes of nutrition, somewhat resembling those of pregnancy, such as dark rings under the eyes or general darkening of the skin by pigmentation, may result from chronic uterine or ovarian disorder. Eczema is not uncommon, and acne still more frequent; while the time of outbreak of these eruptions often has a relation to menstrual periods. With the general breakdown of health to which uterine and ovarian disorder often leads, are frequently seen loss of hair and failure of sight, especially a form of amaurosis depending upon chronic optic neuritis. In patients predisposed to hysteria the multiform manifestations of this disorder are an early result, and are generally aggravated at menstrual periods. In these cases, however, hyperæmia and tenderness, if not inflammation, of one or both ovaries are generally found to exist, in addition to the uterine affection. A vaginal examination, or pressure upon the uterus or ovary, will often excite a nervous paroxysm, noisy eructations, or a feeling of nausea or faintness. In patients having a different predisposition the nervous disturbance may take the form of epilepsy, hystero-epilepsy, or positive mental aberration, generally of the melancholic type.

Some evidence has been adduced that, in cases of uterine disturbance, attacks of articular rheumatism may be repeatedly associated with menstruation. A form of rheumatism has also been described, analogous to gonorrhœal rheumatism, but distinct from it in that it affects chiefly the smaller joints, and arising in connection with leucorrhœa or pregnancy.* While, in gonorrhœal rheumatism, the gonococcus has been demonstrated in the effusion in the joints, there is no evidence whether this form of arthritis is microbic or not. Chronic rheumatoid arthritis is much commoner in the female than in the male sex, and its subjects have often suffered from uterine disturbance, but the connection here may be merely the deteriorating effect of uterine disease upon the health.

Partial or complete paraplegia (such as occasionally arises after delivery, without any difficulty in parturition likely to cause direct lesion of nerve trunks) is another symptom which has been considered a reflex effect of uterine disease, but whose causation is difficult to trace. In most such cases the paralysis is functional, and more or less allied to hysteria. But to call a symptom hysterical is not completely to explain it. Indeed, the hysterical temperament chiefly implies that reflex, as well as emotional, sensibility is exalted, while the control of volition is diminished. Hence, in these cases of paraplegia, as in that of hysterical vomiting, it may be desirable to attempt to remove any uterine cause of irritation, although, especially in the unmarried, overmuch local interference is undesirable, and moral treatment is of chief importance. Whether a reflex paraplegia, dependent upon actual chronic myelitis, can result from uterine inflammation, as the so-called reflex paralysis has been supposed to result from positive and severe inflammation (rather than mere irritation) of the bladder, prostate, or kidneys, there is, as yet, no evidence to decide.

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* See papers by Dr. Ord, "Brit. Med. Journ.," Jan. 31st, 1880; Mr. Davies-Colley, "Obstet. Journ.," June, 1878.

A recent endometritis, in which the parenchyma is not much involved, will generally yield to treatment; but chronic metritis, when it has reached the stage of induration, is one of the most obstinate of diseases. Untreated, it is commonly limited only by senile atrophy; and even under the most judicious treatment, only a relative degree of cure is usually attained, and relapses frequently occur.

Diagnosis.—Corporeal is distinguished from cervical endometritis by the nature of the discharge, which has not the tenacious glairy quality distinctive of the cervical secretion, but is either thin and mucoid, muco-purulent, or, what is more characteristic, has a slight rusty tint. Examination by a speculum is necessary to determine the character of the secretion, since there is not always sufficient excess of it to lead the patient to complain of leucorrhœa. There are also greater tenderness and enlargement of the body of the uterus, as detected by bimanual examination, and disturbance of menstruation is a more constant symptom. The flow may be excessive, or, in chronic cases, scanty; and there is generally pain of the character already described (*see* p. 234). The sound shows lengthening of the uterus, not accounted for by cervical hyperplasia. On reaching the fundus it usually causes considerable pain, and frequently nervous disturbance. Slight bleeding often follows upon its withdrawal. The cervical canal is generally more dilated than normal, but in cases of endometritis of the nulliparous uterus without affection of the cervix it may be the opposite. The cervix may be normal in nulliparous women, but in other cases it is usually involved in the hyperplasia. In cases of doubt whether inflammation affects the body of the uterus or the cervix only, the doubt may be resolved by the persistence of the symptoms after treatment of the cervical disease.

In fungoid endometritis there is continuous or irregular sanguineous discharge. The sound, used by a skilled hand, can generally detect local inequalities on the surface of the mucous membrane. Its use causes increased bleeding. The most complete diagnosis is made by dilating the cervix first with tents, and then with Hegar's dilators up to No. 20, and introducing the index finger up to the fundus to explore. The finger then detects the unequal surface, or the soft villous or polypoid projections, and the absence of any friable growth or excavated ulcer which would indicate cancer.

An adequate diagnosis can, however, be made without introducing the finger. The cervix is dilated up to about No. 12 of Hegar's dilators. Ovum forceps are then introduced, and will seize and bring away any polypoid projections. The uterus is afterwards curetted, and the curette may bring away some more. In the more diffused form of adenomatous hypertrophy there may be no projections to seize with forceps; but the curette scrapes away a more abundant mucous membrane than normal. The fragments removed are hardened, and microscopic sections cut of them. The structure characteristic of hæmorrhagic endometritis and the mode of distinguishing it from commencing cancer have already been described (*see* p. 227).

To distinguish senile endometritis from cancer it is also necessary to dilate and curette the uterus, to obtain tissue for microscopic investigation.

In pyometra the fundus uteri is enlarged, and somewhat soft and elastic. If the canal is not entirely occluded, the diagnosis is made by the character of the discharge which escapes or can be squeezed out. If it is occluded, a probable diagnosis is made from the presence of some cause of occlusion, such as cancer, likely to cause pyometra. It may be impossible absolutely to distinguish pyometra from hæmatometra or hydrometra till the fluid is evacuated.

Treatment.—All exciting causes, such as inflammation of the cervix, or serious displacement of the uterus, should be removed if possible. Thus, when erosion or cervical endometritis is present, local treatment should be directed to the cervix first, since it is more readily accessible to such medication. When displacements are present the most important point to decide is whether to resort at once to a pessary, or first to treat directly the inflammation. As a general rule, in retroversion or retroflexion of any important degree, as well as in prolapse, a vaginal pessary may be employed with advantage either immediately or after a short course of rest and local depletion, and the successful use of other means will then be facilitated. Even when no displacement can be detected, relief is sometimes afforded by the use of a Hodge's or elastic ring pessary, which limits the mobility of the tender uterus, keeps it in a position of slight anteversion, and resists any tendency to partial prolapse. The hypogastric belt may also give relief.

Active and passive hyperæmia are to be treated by the means enumerated under those headings (pp. 163, 168), especially frequent.

but not too prolonged, rest in a completely horizontal position, the use of hot water injections, the administration of saline laxatives, bromide and iodide of potassium, ergot, strychnia or digitalis, and, when much tenderness is present, local depletion either by blood-letting or the application of glycerine. Of these means, ergot combined with strychnia, given in the intervals of menses, is the most effective in the earlier stage, while the uterus is soft and menstruation excessive, especially if there is subinvolution in addition. Coitus must be strictly limited, though it is not always desirable to enforce an absolute prohibition, especially when ovarian hyperæmia exists. But a holiday for the wife for a month or two completely away from her husband often has a beneficial effect. If the question arises of the use of preventives against pregnancy, patients should be advised that it is preferable not to use them, unless some urgent need for them exists; and the method of withdrawal should in all cases be discountenanced. If there is some strong reason against the occurrence of pregnancy, such as a contracted pelvis, or renal or cardiac disease, or if the patient is determined to prevent it for pecuniary reasons, the best method, in the interest of the wife's health, is for the husband to use a sheath (condom or French letter). Those of thin fish-skin are the best for the purpose. If the husband objects to these, the plan of using a douche of warm water immediately after coitus generally succeeds, if used thoroughly and quickly enough, but sometimes it fails. It is more effectual if an "anti-conception pessary" of india-rubber is also introduced before coitus. The best form of this consists of a shallow cup of india-rubber, about two inches in diameter, of which the rim is formed by a thin watch-spring. If this is passed up the vagina, with the concavity forward, it covers the cervix, and prevents the spermatozoa gaining the cervical canal at the moment of emission and before the douche can be used. If made of rubber only, without the rim of watch-spring, the instrument cannot be relied upon to go into the right position. The addition of a weak antiseptic, such as perchloride of mercury, 1 in 6,000 or 1 in 4,000, to the douche perhaps renders it more certain; but plain water kills spermatozoa when it reaches them. Quinine pessaries, introduced before coitus as a preventive of pregnancy, are innocuous but uncertain.

Internal remedies have little influence upon the inflammation of the parenchyma; but when the enlargement is passing into the stage of induration, the liquor hydrargyri perchloridi may be given in doses of from thirty to eighty minims three times a day.* This may often be usefully combined with small doses of quinine, or, in the absence of general or local hyperæmia, of the tincture of perchloride of iron. Iodide of potassium may also be tried as an absorbent, or, if menstruation is scanty, tincture of iodine in doses of from five to ten minims. The latter often acts as an emmenagogue in chronic metritis.

Every possible hygienic means should be taken to promote the general health, especially by fresh air, cold or sea bathing, sufficient mental occupation, and change of scene. A stay at a pleasant watering-place or hydropathic establishment, or a sea voyage, is thus of great service. These advantages may be combined with the effects of bromine and iodine in mineral waters, both in the form of baths and internally, at certain celebrated watering-places, especially Kreuznach, the virtue of whose water depends chiefly upon bromide of magnesium. The water of Woodhall Spa, in Lincolnshire, has a similar effect, but contains a greater proportion of iodine. The imported Kreuznach salt may also be used for hip baths, or, in concentrated solution, for abdominal compresses. The other foreign spas most celebrated in the treatment of chronic metritis are Ems, especially for cases having a considerable nerve element; Franzensbad and Marienbad, noted for their iron-mud baths; and Schwalbach, for cases in which anæmia is a prominent feature.

Diet should be nourishing but very simple, in view of the so constantly attending dyspepsia. Alcohol should be much restricted, since by relaxing the arteries it promotes active hyperæmia; and, moreover, chronic uterine disease is one of the commonest causes of intemperance in women, who are led to take spirits for the temporary relief of pain, or of the feeling of sinking or depression from which they so often suffer. Taken with meals, however, a moderate allowance of alcohol may be useful as a stimulus to digestion, and a good claret or Burgundy is generally the best form to recommend. If any tendency to excess be suspected, it is better to enjoin total abstinence. The treatment by massage for cases of neurasthenia with emaciation, associated with chronic uterine or ovarian disorder, will be described under the head of Ovaritis.

In so protracted a disorder as chronic metritis, it is desirable to avoid as far as possible the administration of opium or morphia, lest the patient become dependent upon the drug. If required during exacerbations or at menstrual periods, a morphia suppository may be given *per rectum*. For soothing pain, warm hip-baths, or what are still more effective, whole baths, are a valuable resource. Vaginal douches at a temperature of 110° to 115° F. have the further effect of stimulating absorption and diminishing the size of the uterus by the contraction of the uterine muscular fibres, and of the arterial walls, which they produce. It is well, however, to commence the injections at a more moderate temperature, and gradually to increase the heat. When sedatives are required, others than opium may be tried in the first place. Bromide of potassium, belladonna, hyoscyamus, cannabis indica, or camphor may be given internally, and chloral if required to produce sleep. Of these belladonna acts most upon the sympathetic system, and is especially valuable in vesical tenesmus, while it is often a useful addition to opium; hyoscyamus has a greater soporific effect; and both of these are useful for their laxative tendency. Cannabis indica has a special influence in neuralgia and headache, besides being a general sedative. Camphor is an anaphrodisiac as well as sedative if given in doses of as much as five grains. Camphor monobromide has also been used as a sedative, in doses of from two to ten grains, in pills with one-third of its weight of curd soap and proof spirit *q.s.* It is also prepared in perles containing about two grains. Iodoform may be given with advantage in a suppository containing three grains introduced *per rectum*, as an alternative to the use of iodine or the iodides by the mouth. Belladonna suppositories are more effectual *per rectum* than *per vaginam*. Sedatives are also useful when introduced *per vaginam*, but must then be employed in larger doses. Absorbents, such as iodine, iodide of potassium, or iodoform, may be used in the same way (*see* p. 208).

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* For prolonged use, the mercury is most readily taken after meals in the following mixture:—Liq. Hydrarg. Perchlor. ♏lx.—lxxx.; Acid. Hydrochlor. dil. ♏x.; Syrupi ʒj.; Aq. ad ℥j.—ter quotidie.

Counter-irritants are not only valuable for relief of pain, but exercise an alterative effect upon chronic inflammation. They also appear to relieve reflex neuroses, such as vomiting, by a kind of inhibitory effect upon the nervous system. Flying blisters may be produced on the hypogastrium or groins by blistering fluid, and repeated at intervals. If, however, there is any tendency to vesical tenesmus, it is well to avoid the use of cantharides, and employ some other counter-irritant, as the liquor iodi fortis or Churchill's tincture of iodine (*see* p. 211), repeatedly applied. Reflex pains may be relieved by applications to the nerve-terminations at the seat of pain, such as mustard poultices, turpentine fomentations, or a small quantity of the linimentum sinapis co. sprinkled on spongio-piline and kept applied six or eight hours. As a counter-irritant the linimentum crotonis may be applied with a sponge, or, as a sedative, equal parts of linimentum aconiti and linimentum belladonnæ may be used. In the same way comfort is afforded by plasters applied to the back, for which purpose emplastrum calefaciens or emplastrum belladonnæ may be used.

Strong caustic applications to the cervix, which have been considered under the head of Hyperplasia (p. 156), may prove more effectual counter-irritants than those applied externally. A vesicating effect on the cervix, followed by a flow of serum, may be produced by vesicating collodion, painted with a brush over the whole cervix, and followed by the application of a tampon soaked in glycerine. Care must be taken to protect the vagina and vulva in making the application.

Tonic treatment, such as that described under the head of Inflammation of the Cervix (p. 203), is generally useful in the course of chronic endometritis and metritis. Iron should not be given when there is a furred tongue, or any sign of portal congestion, till this condition has been relieved by occasional mercurial purgatives or other means. It is likely, also, to prove injurious while there is any marked hyperæmia or tenderness of uterus. In the later stage, however, when there is much general debility, and a flabby tongue impressed by the teeth, it is often of service, especially if combined with a laxative (*see* p. 203). In the stage of hyperplasia with induration, when menstruation is scanty, iron may be added to bromide of potassium, and, if necessary, aloes also. Bromide of potassium alone in such cases is apt to diminish the menstrual flow and prolong the intervals.

Intra-uterine Medication.—When endometritis, not complicated by any considerable degree of metritis, fails to yield to general remedies and local treatment to the cervix, the most efficacious method is to apply remedies directly to the cavity of the uterus. If there is considerable inflammation of the parenchyma, but yet endometritis is the starting point of, or forms a prominent feature in, the inflammation, it may similarly become desirable to treat the mucous membrane directly. In this case, however, more caution in the use of local remedies is necessary, and hyperæmia should in the first place be relieved as far as possible. The cases most urgently calling for intra-uterine medication are those of villous endometritis with hæmorrhage.

Operation of Curetting.—In fungoid or hæmorrhagic endometritis, attended with hæmorrhage, the only effectual treatment is to dilate and curette the uterus; and this should be done without delay, especially in cases where there may be a suspicion of malignancy. The same treatment is also the best and most rapid cure for many cases of ordinary endometritis, especially for the more severe forms of it in which the inflammation of the endometrium is microbic, or the discharge purulent or muco-purulent; also for all cases of which menorrhagia is a symptom, since this generally implies that there is some adenomatous hypertrophy of the mucous membrane, and this can be improved, if not entirely cured, by the operation.

The efficacy of this treatment depends upon the fact that the endometrium consists of an embryonic form of cellular tissue, which has no formed fibres, and can easily be removed almost entirely by the curette, and that it has a great power of renovation, so that it is entirely renewed within two or three weeks. Thus, I have scraped away as thoroughly as possible with the sharp steel curette the mucous membrane in a case of fungoid endometritis, and, removing the uterus fourteen days later, have found a thick, perfectly smooth, and apparently normal mucous membrane completely replaced. Thus curetting alters the character of the mucous membrane more completely than any injections or intra-uterine applications, with the exception of strong caustics, can do; and it causes much less pain or disturbance than strong caustics. It can also, if thoroughly carried out, probably be made to remove all the tissue in which gonococci or other microbes may be multiplying, with the exception of a deep-seated septic infection.

It is possible to carry out the operation without an anæsthetic, if the cervical canal is of fair size to start with and the patient tolerant. But an anæsthetic is always advisable, since it allows a more considerable dilatation of the canal, and thus ensures more free drainage. Some advise the use of Thomas's blunt curette, consisting of a loop of copper wire, for fear of injury being done to the wall of the uterus. This suffices to remove soft prominences, but it cannot remove the whole of the mucous membrane as thoroughly as Sims' sharp steel curette (Figs. 121, 122, p. 213). The sharp curette is quite as safe in skilled hands, and causes no more disturbance.

For the operation the patient is placed in the lateral position, Sims' speculum is applied, and the cervix drawn down to the vulva with vulsella. It is well to dilate the cervical canal, if not too rigid, to the size of No. 12 or No. 13 Hegar's dilator, to allow quite free drainage; but the curetting can be easily carried out with a dilatation only up to the size of No. 10, or even No. 8.

If there is any suspicion of malignancy, a sharp scoop should first be used to remove some pieces of tissue from the endometrium for microscopic examination. The pattern shown in Fig. 133 may be used, or that shown in Fig. 134, according to the size of the cervical canal. The scoop holds the piece of tissue which it cuts out better than the curette. If the scoop shows the lining of the uterus to be so friable as to raise a strong presumption of cancer, or if soft masses of tissue come away on the dilatation, it is better not to curette the general surface until the pieces removed have been tested microscopically. If they prove malignant, a radical operation should be done, if possible, without delay.

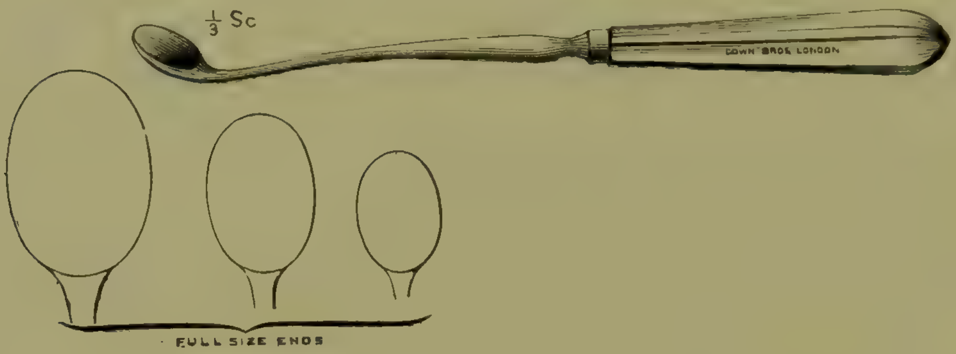

Fig. 133.—Uterine Scoop.

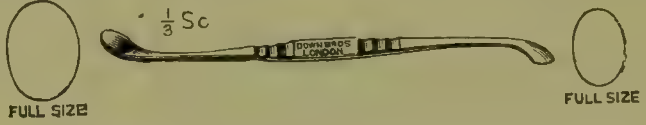

Fig. 134.—Double-ended Uterine Scoop.

In all cases of fungoid endometritis, or any in which metrorrhagia is a symptom, it is well, before using the curette, to pass ovum forceps up to the fundus, and bring away any tissue which can be seized by them. In this way the diagnosis of polypoid projections is confirmed. The forceps, if passed up till they touch the fundus, with the blades lateral and reaching up to the corners of the uterus, easily secure any prominences from the extreme fundus. Those growing in this position might easily be missed by the curette in scraping the walls, and the patient remain uncured. The forceps are passed up repeatedly, so long as they bring anything away.

In the use of the curette, the instrument is passed gently up till it is felt to touch the fundus, and the scraping is effected by drawing it firmly downward as low as the internal os. The operator can feel, and hear by the grating sound, when the edge of the instrument has penetrated the surface and bites into the tissue. It is necessary to go regularly two or three times over the whole of the anterior and posterior walls and sides of the uterus, and also to pass the curette across the top from one corner to the other, to make sure that no portion of the mucous membrane is left unscraped. If the cervical canal is unhealthy, this should be scraped also. But in this case the mucous membrane is tough, and the curette does not remove much more than the surface epithelium.

The character of the mucous membrane will be modified more considerably if a mild caustic is applied after the curetting. This should generally be done, unless a plastic operation on the cervix is performed at the same time. One of the best is iodized phenol (*see* p. 211), especially in cases of hæmorrhage. Churchill's tincture of iodine (*see* p. 211) may also be used. After an interval left for the bleeding to subside, a Playfair's probe or sound, rather thickly wrapped in cotton-wool, is dipped in the caustic and passed up to the fundus. The vagina and vulva should be protected by a flat piece of cotton-wool, moistened with antiseptic, and placed beneath the external os. In general it is well to let the cervix receive the application as well as the fundus. If it is desired to spare the cervix, it may be protected by a vulcanite canula, such as that shown in Fig. 55, p. 65, through which the wrapped probe is passed.

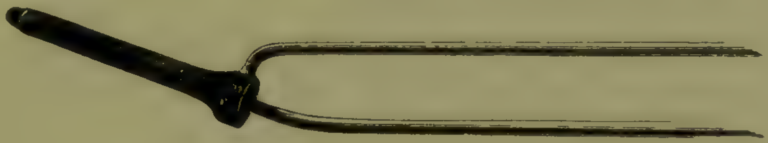

Fig. 135.—Canula for Intra-uterine Medication.

Some authorities, and especially American authorities, recommend that in all cases after curetting the uterus should be plugged with a thin strip of iodoform gauze, passed up to the fundus, and removed after forty-eight or twenty-four hours In this case no caustic is used. The patient suffers less inconvenience if the gauze plugging is omitted, even with the addition of the caustic application. The plug is quite unnecessary to arrest hæmorrhage, which is never serious. I consider, therefore, that the plug is desirable only when curetting is employed in cases of septic infection, where the microbes are deep in the tissues, and it is desired to get the prolonged effect of an antiseptic upon them. In such cases the plug may be renewed once or twice. Sterilized moist iodoform gauze, 10 per cent., should be used.

After curetting it is well to keep the patient in bed for ten days. I generally have a douche of perchloride of mercury, 1 in 3,000, used twice a day for that time, and an iodoform suppository (five grains) introduced into the vagina after each douche for the first three days.

It is sometimes necessary to repeat the curetting a second or third time, at an interval of a few months, or even sooner, before a cure is effected, especially in cases of hæmorrhagic endometritis. In such cases a stronger caustic may be called for, on recurrence of the symptoms.

Application of Liquid Caustics.—In slighter cases of endometritis, intra-uterine medication can be carried out without an anæsthetic by making applications in a liquid form by means of a Playfair's probe or sound wrapped in absorbent cotton-wool, in the same way that such applications are made in cervical endometritis. For this it is necessary that the cervical canal should be of full size, or capable of being dilated without great pain by dilating sounds (Fig. 134). There is the disadvantage that some of the liquid may be squeezed out in the cervix, but this may be overcome by wrapping the probes very thinly and evenly, and by using two or three probes in succession. In many cases the cervix partakes in the inflammation with the fundus, and may with advantage share in the application. If it is desired to limit the application to the fundus, the cervix may be protected by the vulcanite canula (Fig. 55, p. 65), which also tends to prevent so much of the fluid being squeezed out before it reaches the fundus. For the application Sims' speculum and the semi-prone position should be employed, and it may be necessary to draw down the cervix with a sharp hook.

The most generally useful liquids for application are strong liquefied carbolic acid, carbolic acid diluted with an equal quantity of glycerine, liquor iodi fortis, Churchill's tincture of iodine (see p. 211), iodized phenol, solutions of nitrate of silver from twenty to forty grains to the ounce, protargol from thirty to sixty grains to the ounce, or chloride of zinc, thirty grains to the ounce. Applications may be made at intervals of from ten to fourteen days.

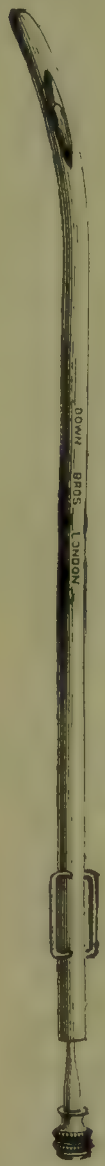

Fig. 136.—Barnes' Ointment Positor.

Liquid applications, such as that of liquor iodi fortis, may also be made by means of Barnes' ointment positor (Fig. 136), a tube provided with a piston, if a little of the fluid is placed upon a small piece of sponge and inserted in the tube of the instrument. The same instrument may be employed for introducing drugs in the form of ointment, such as the ointment of iodide of mercury or iodoform ointment.

A liquid may also be applied by saturating with it a thin ribbon of gauze, passing it up to the fundus, and leaving it *in situ*. Reed recommends the following treatment for microbic endometritis:—A thin strip of sterilized gauze is passed up to the fundus and immediately withdrawn, bringing with it the mucus contained in the cavity and canal. A second thin strip is saturated in strong liquefied carbolic acid (98 per cent.), passed up to the fundus, and left *in situ*. A tampon of cotton-wool soaked in glycerine is placed in the vagina, and the patient is allowed to go home, to return in forty-eight hours for a repetition of the treatment. Three or four applications of the kind are made at lengthening intervals within about ten days; and it is stated that the treatment is not particularly painful.

In the case of a cervix too narrow to allow a wrapped probe to pass of sufficient bulk to carry an adequate amount of liquid to the fundus without its being squeezed out in the cervical canal, the best method of application is by what has been called the applicator-syringe. This is a small syringe with a fine curved nozzle, having lateral apertures, and capable of being bent to any curve (Fig. 137, p. 250). The nozzle is wrapped very finely with a thin layer of absorbent cotton. It is then passed to the fundus, and the piston pressed very gently, so that a little fluid exudes through the cotton-wool, and does not cause pain or shock by distending the uterus. In the syringe shown in Fig. 137 a screw on the piston regulates the number of minims to be injected. To prevent the cotton-wool slipping off and remaining in the uterus, the exterior of the nozzle may be roughened, as shown in Fig. 137, or the nozzle and film of cotton-wool may be used longer than the uterine cavity, so that the film is not buried in the uterus, even if it slips off.

Use of Solid Bougies.—The introduction of solid bodies into the uterus is not usually so convenient as that of liquids, since they are apt to set up uterine colic. This has been the case especially when small pieces of solid nitrate of silver have been introduced into the fundus. Milder astringents and absorbents may, however, be used in the form of slender medicated bougies, provided that the material is such that it readily dissolves in the uterine cavity. The gelatine bougies described at p. 214 may be thus used, and applied by the instrument shown in Fig. 123, p. 214, passed up to the fundus. The most useful drugs for the purpose are iodine (gr. v.—x.), iodine and carbolic acid (āā gr. v.), iodoform (gr. v.—x.), iodoform and alum (āā gr. v.), sulphate of zinc (gr. v.—x.).

A mild application of the solid nitrate of silver may be made to the interior of the uterus in the following way:—The bulbous end of a uterine probe is slightly roughened, and then, after being warmed, dipped repeatedly in the nitrate of silver, fused in a platinum or porcelain capsule, until it is sufficiently coated. It is then passed up to the fundus.

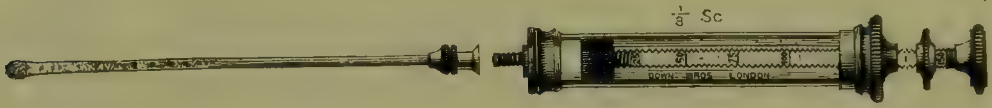

Fig. 137.—Uterine Applicator-Syringe.

Powders may be applied to the interior of the uterus by an insufflator (Fig. 138); but this method does not distribute the drug so evenly over the endometrium as a liquid application. Iodoform or tannin, or a mixture of the two, may be used in this way.

These methods of treatment are more tedious and often less effective than curetting; and most patients would be wise in electing to go through that operation rather than be subjected to the frequent manipulations required for the other modes of intra-uterine medication. They are chiefly of value for patients who prefer prolonged treatment to the taking an anæsthetic, or operation of any kind, and those whose cure is not completed by curetting.

Injection of Liquids.—The method of intra-uterine medication by injection of liquids is rarely practised in this country, since it involves more danger than other modes. Uterine colic may be set up by the shock of dilating the uterus; but the chief danger lies in the risk of the liquid making its way along the Fallopian tubes, either from the force of the injection, or, what is more probable, from spasmodic contraction of the uterus. This has been demonstrated by necropsy in cases where a rapidly fatal result has followed the injection of perchloride of iron, even though the Fallopian tubes were not obviously more patent than normal. The risk is not entirely obviated by securing full dilatation of the cervix—a precaution which should always be taken—for the cervix generally contracts under the influence of an astringent; nor by the use of a double-action catheter, for a clot or shred of mucus may interfere with the return canal.

The safest plan is to use Budin's double-action catheter (*see* p. 181), and to previously dilate the cervix, if necessary, till a small-sized metal one can be passed. The force used should be by hydrostatic pressure by means of a funnel or irrigator only slightly elevated. Strong caustic or irritant solutions should not be used by the method of injection; but some Continental authorities highly praise the treatment of chronic endometritis by solutions, such as carbolic acid 2 per cent., or weak solutions of iodine (tr. iodi. ʒij.—iv. ad aq. Oj.).

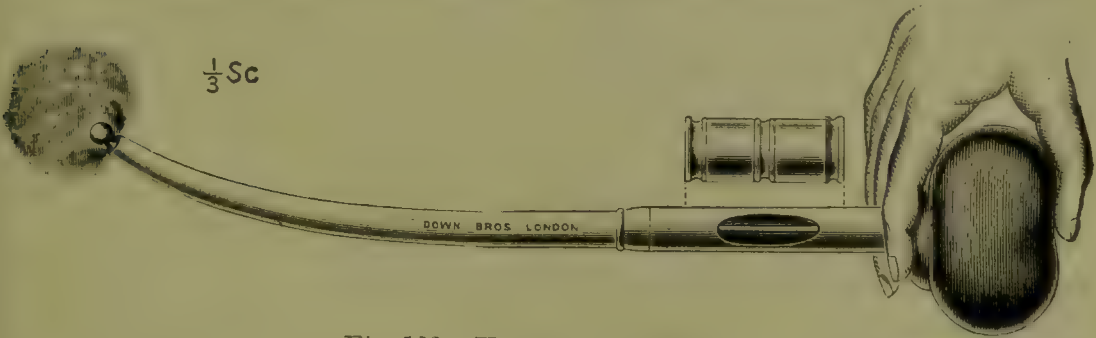

Fig. 138.—Uterine Insufflator.

Continuous Electrical Current.—The application of electricity in the form of the continuous current to the endometrium acts mainly by the production of a chemical caustic, although other modes of action have been attributed to it. As compared with curetting followed by liquid caustic applications, it has to a certain extent the same disadvantage as atmokausis, namely, that its action is apt to be more concentrated near the narrower isthmus, and less marked at the wider fundus, though this may to a certain extent be avoided by special manipulations. For the treatment of endometritis, some twenty-five applications, spread over at least two months, are generally required. Hence the treatment is most suited for patients to whom time and expense are not a great consideration, and who either object to an operation, or have found curetting fail to effect a cure.

The application should be made according to the method introduced by Apostoli, the details of which are described in the chapter on Fibroid Tumours of the Uterus. A platinum sound, with an insulating sheath to protect the cervix, is passed up into the uterus, and is connected with the positive pole. A large electrode applied to the abdomen is attached to the negative pole. After a few applications the thick, short platinum sound, or Apostoli's carbon electrode, may be substituted for the ordinary platinum sound-electrode, the active part being shifted down the cavity length by length. If it is held in the upper portion of the fundus for a greater proportionate time, the disadvantage of the caustic effect being too concentrated near the isthmus may be avoided. Both this and the ordinary platinum sound should be turned from side to side at intervals, so as to reach both corners of the uterus.

If the cervix is very small it must be dilated somewhat with conical dilators (see p. 134). The negative pole has a more powerful caustic effect; but it causes more pain, and is apt to cause hæmorrhage when there was none previously, doubtless from burning a wound in the endometrium. The positive pole, on the other hand, tends to check hæmorrhage, and should almost exclusively be chosen in the treatment of endometritis, especially when there is menorrhagia or metrorrhagia.

The current should be gradually increased, maintained at its maximum for about ten minutes, and gradually reduced. It should not cause any serious pain. For the first few applications it is sufficient to reach 40 or 50 milliampères. Afterwards the strength may be gradually increased until it reaches 100 or even 150 milliampères. A douche should be used before and after the application. If any pain persists afterwards, the patient should use a hot douche and go to bed. During the treatment, avoidance of any undue exertion and abstinence from coitus should be enforced; and the treatment should be intermitted during the menstrual period, at any rate for five days. When pain is produced by the current, it is recommended by Milne Murray, at the end of the application, to attach the electrodes to the terminals of a secondary Faradic coil. The hammer should be set to give the most rapid interruptions possible. The apparatus is started with the current at its weakest, and gradually increased until the patient begins to feel a sensation of numbness in the pelvis; after which time it may be continued for three or four minutes and then stopped. Weak continuous currents, from 15 to 30 milliampères, are said by themselves to relieve pain, and are sometimes used for that purpose.

In the use of powerful caustic currents it is necessary to bear in mind the risk that, the resisting power of the mucous membrane and its secretion to microbes being destroyed by the inflammation set up, infection may take place, and extend along the Fallopian tubes to the peritoneum. This risk appears to be greater than after curetting, for, in that case, the mucous membrane begins to be regenerated after a few days, during which time the patient is kept in bed, and careful antiseptic precautions are used.

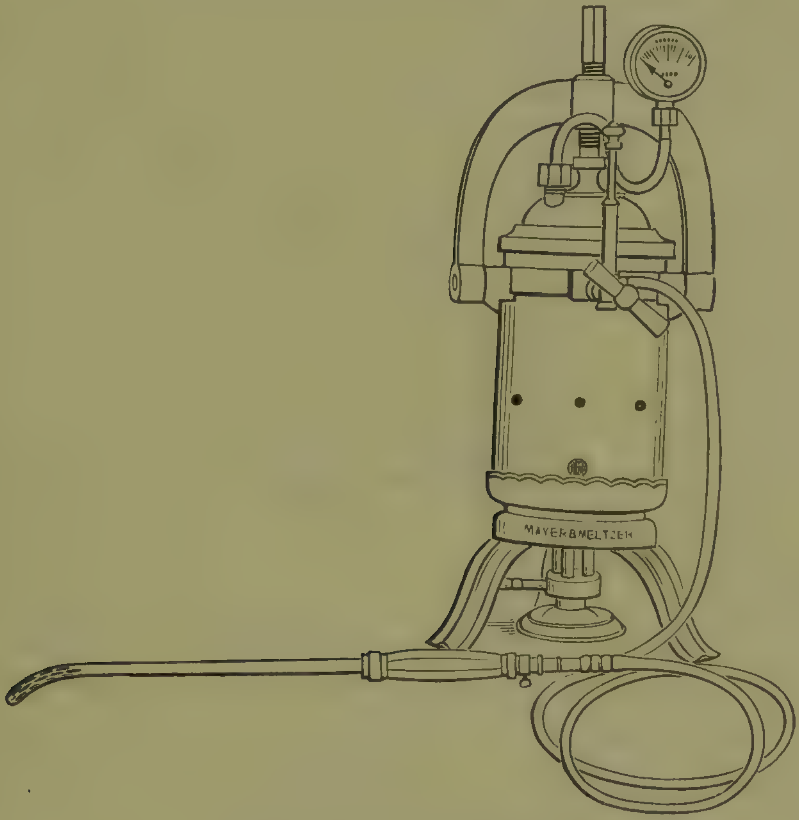

Fig. 139.—Sneguireff's Atmocautery.

Use of Nitric Acid.—An effective caustic for the cure of hæmorrhage is nitric acid; but it is capable of permanently damaging, and even destroying, the endometrium, unless great caution is used, and it should only be employed if milder ones fail. A canula of good size, fitting tightly in the dilated cervical canal, should be used to protect the cervix. The canula, mounted in a handle, shown in Fig. 135, p. 247, is generally not made large enough. A Simon's urethral speculum of vulcanite (Fig. 55, p. 65), of size equal to Hegar's dilator No. 12, answers the purpose well, if held by the rim with a pair of pressure forceps. After curetting, the blood is washed out of the uterus with sterilized water by means of a small syringe with a long narrow nozzle passed up through the canula, and any excess of water sucked out or allowed to escape. A wrapped probe dipped in the nitric acid is then passed up to the fundus, and carried to each corner of the uterus. After a time considered sufficient for the action of

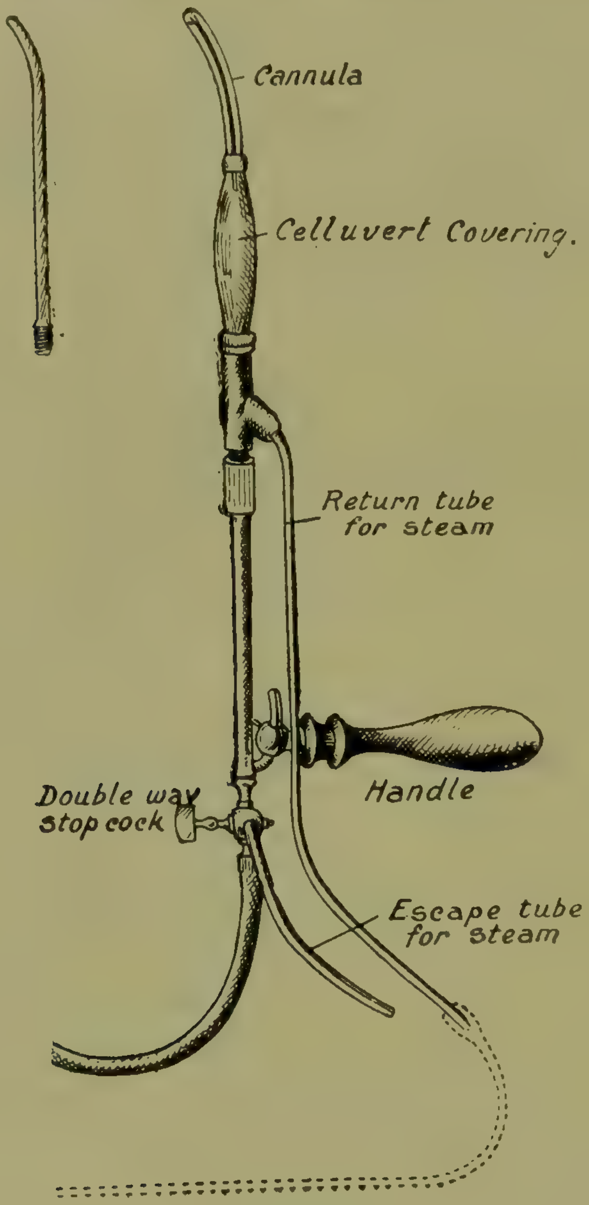

Fig. 140.
Delivery Tube of Pincus' Atmocautery.

the caustic, say two minutes, the uterus is again washed out through the canula with sterilized water.

Atmokausis.—By atmokausis or vaporization of the uterus is meant the burning of the interior of the uterus with steam. This mode of treatment has been employed rather extensively of late in Russia, Germany, and elsewhere abroad, but has not yet been adopted much in England.

The apparatus required is a small steam boiler, capable of withstanding a pressure of three atmospheres, fitted with a safety valve and pressure gauge or thermometer. The steam is conducted by a thick-walled rubber tube to the intra-uterine canula. The two instruments chiefly in use are that of Sneguireff of Moscow, and that of Pincus of Danzig. In the latter the intra-uterine tube is doubled-channelled, and has a protected handle attached to it at right angles. The double channel is intended to carry away the returning steam so that it does not escape through the cervix, but this can only act if the tube fits the cervix tightly. The part of the metal tube which lies in the cervical canal is protected by a non-conducting covering, or by a piece of india-rubber tubing cut to suit the length of the cervix in the particular case. In a modification, called the zesto-cautery, the steam does not come into direct contact with the uterus, but is employed to heat a hollow intra-uterine metal tube.

The operation can be performed without an anæsthetic, and is said not to cause great pain, but it is better to employ an anæsthetic. Any inflammation of the pelvis outside the uterus is a contra-indication to its performance. The cervix is dilated first with a tent, then with Hegar's dilators, until it admits the finger. In cases of fungoid or hypertrophic endometritis the uterus should be first curetted; in atrophic or senile endometritis this is not necessary. After curetting the cavity is washed out with an antiseptic solution at 115° Fahr., to arrest hæmorrhage. It is recommended to use the steam at a temperature of 115° C. in the boiler. The steam, as it enters the uterus, will be at a lower temperature than this, losing heat as it expands on the reduction of pressure, and it is doubtful if its temperature is above 100° C. The duration of the application should generally be from fifteen to thirty seconds, measured from the time when steam is seen to escape from the return tube or from the uterus. But the application has been made for as long as two minutes, when it is desired to destroy the mucous membrane or obliterate the cavity of the uterus. The intra-uterine tube should not be introduced for more than two-thirds of the distance from the internal os to the fundus, since death has occurred in one case from perforation of the uterus, doubtless through a slough formed by burning with the tube.

The patient should be kept in bed for ten days. Sloughs begin to separate about the end of the first week. If colicky uterine contractions occur at this time, a speculum may be passed, and any shreds of tissue found in the cervical canal or body of uterus removed with forceps.

The disadvantages of the treatment are that it is difficult to regulate the degree of caustic effect, on account of differences in the size of the cavity of the uterus, or of the amount of blood present in it. Since the size of the cavity expands from below upward, the burning is more concentrated near the isthmus, and the mucous membrane may be completely destroyed there, while near the fundus it is but little affected. This leads to the risk of constriction or obliteration of the canal, with retention of menstrual or mucoid fluid. The burning is probably effected as much by the metal tube as by the steam, and hence is likely to affect unequally the part touched by the tube.

The manipulation for protecting the cervix and isthmus appears to be defective; and it would probably be better to pass the intra-uterine tube through a vulcanite canula tightly fitting the dilated cervix, as recommended above for the application of nitric acid. The returning steam would then escape clear of the vulva. The metal delivery tube might also be covered entirely with a rubber tube perforated with holes, so that the cauterization should be effected by the steam, and not by the metal tube, a good conductor of heat, which is likely to cause an unequal burning. Out of a considerable number of operations performed abroad the mortality has been estimated at ·37 per cent., and the proportion of cases followed by inflammation outside the uterus, in the form of parametritis or perimetritis, at 5·5 per cent.*

Atmokausis has been performed for the treatment of various kinds of endometritis. But, on account of the uncertainty in the amount of destruction produced in the mucous membrane, it appears to be unadvisable treatment when it is desired to preserve the functions of the uterus. It is recommended for cases of hæmorrhage near the menopause which resist treatment by curetting and the milder caustics, but these are very rare. At present I am disposed to limit the treatment to cases of hæmorrhage or senile endometritis which other treatment fails to cure, and in which the only remaining alternative is removal of the uterus. It may also be employed if it is desired to sterilize a patient without the performance of abdominal section. In such cases the application of steam should be long enough completely to destroy the mucous membrane. If this object is not attained the operation may be repeated.

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* See Blacker, "Vaporization of the Uterus" ("Journ. of Obstet. and Gynæc.," May, 1902).

MEMBRANOUS DYSMENORRHŒA.

Causation and Pathological Anatomy.—In connection with endometritis may be considered the disorder called membranous dysmenorrhœa, which by some has been termed exfoliative endometritis, although it is still a matter of dispute whether its essential nature is inflammatory or not. It consists of the expulsion during the menstrual period, generally on the second or third day, of membrane either in shreds or forming a more or less complete cast of the uterus, which membrane, when examined microscopically, shows the structure of the uterine mucous membrane. Many other apparent membranes may be passed at a menstrual period, such as fibrinous clots, exfoliations from the vagina or cervix, or mucus coagulated by astringents; but such cases have no connection with the disease under consideration. It is also to be distinguished from cases in which repeated abortion occurs at intervals of little more than a month, a condition which may be due to an excess of menstrual nisus, or, perhaps, in some cases, to an imperfect fertility on the part of the husband. Some have supposed that all cases of so-called membranous dysmenorrhœa are to be thus explained; but it has been clearly shown that the complaint may occur in virgins.

Membranous dysmenorrhœa consists essentially in a menstrual decidua being thrown off in pieces of greater or less size. This result may depend upon excessive growth, abnormal exfoliation, or an unduly fibrous character in the decidua, and the true explanation is not yet fully ascertained. A few years ago it was supposed by many that the whole thickness of the uterine mucous membrane is normally thrown off in menstruation; and then it was held that the essence of membranous dysmenorrhœa was that the endometrium is too fibrous, and fails to disintegrate into small fragments. Now it is generally believed that normally only the most superficial layer is exfoliated, from which it follows that the most important element in membranous dysmenorrhœa must be excessive development or excessive exfoliation.

The disorder may exist in any degree. If the fragments of supposed clot passed in cases of dysmenorrhœa are examined microscopically, it is not uncommon to find small shreds having the cellular structure of the uterine mucous membrane, and showing a few tubular channels, which are the gland apertures, generally divested of their epithelial lining. The comparative frequency of this condition is an argument in favour of the view that some degree, at any rate, of exfoliation takes place normally in menstruation. From this every grade may occur up to that in which a triangular cast of the whole uterus, showing orifices corresponding to the Fallopian tubes, is passed, although the slighter degrees generally escape the attention of the patient herself. In the complete cast the whole structure of the mucous membrane is to be seen, including enlarged orifices of glands, and an undue amount of fibrillar tissue is to be found among the cells.

In some cases a cast is expelled every month, in others only occasionally, while smaller shreds of membrane come away at the intervening periods. Sometimes there is a history of similar shreds having been passed since the first commencement of menstruation, which renders it probable that the affection may depend upon some peculiarity in the structure of the mucous membrane in certain individuals. More often the membranes only begin to appear after menstruation has continued for years. Married life appears to promote the disease, for it is estimated that 80 per cent. of the cases occur in married women. In some cases temporary separation between husband and wife stops or diminishes the formation of the membranes, although it appears certain that they are not due to repeated abortions.

Membranous dysmenorrhœa is usually associated with active hyperæmia, and other signs of chronic endometritis and metritis. There is often also true hypertrophy of the muscular walls, owing to difficulty in the expulsion of the membranes. Sir John Williams has maintained* that the pathology of the complaint is the presence of an undue amount of fibrous tissue in the uterine walls, and that the inflammation which usually accompanies it is secondary to the irritation produced by the shreds of membrane. Excess of fibrous tissue, however, is very common as a sequel to subinvolution with chronic metritis, without leading to any such result as membranous dysmenorrhœa, in which complaint it seems more probable that there is generally a congenital excess in the fibrillation of the uterine mucous membrane, or in the degree of its exfoliation, or in both, and that this excess is further increased from the effect of chronic endometritis.

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* "Obst. Trans.," vol. xix.

Results and Symptoms.—The symptoms of membranous dysmenorrhœa, apart from those due to the hyperæmia or inflammation generally associated with it, consist simply of the pain and tenesmus evoked by the expulsion of the membrane. The pain varies much in degree. Sometimes it amounts to a very acute colic; but, as a rule, it is not so intense as that often felt in the so-called spasmodic dysmenorrhœa. Sometimes the membranes are passed without any appreciable pain. After the passing of the membrane, the pain is generally relieved. Menstruation is in most cases profuse, or, at any rate, not scanty—a condition which supports the view that congestive hypertrophy of the endometrium exists. When the affection exists in any marked degree it usually gives rise to sterility. It is one of extreme obstinacy, and frequently persists for many years.

Diagnosis.—The more perfect casts are easily recognized by the naked eye, and the orifices of the uterine glands may be seen in them. Generally, however, the diagnosis must be confirmed by microscopic examination. If the membrane is thin, it may simply be spread out upon the slide. If it is too thick to show its structure in this way, sections of it, parallel to the surface, should be made by the microtome. If the cast has the structure of uterine mucous membrane, it only remains to distinguish the case from one of repeated abortion. The latter is generally characterized by irregularity in the intervals of apparent menstruation, and the discovery of an ovum or chorionic villi in connection with the membrane. One test is to try the effect of temporary separation between husband and wife; but this may be occasionally fallacious, for the reason mentioned above. The decidual cells are developed to a greater size in the case of pregnancy.

Treatment.—The first indication is to secure a freely open and straight cervical canal of much greater dimensions than are needful in the normal uterus. By this means distress is much alleviated, and the tendency of the membrane to keep up inflammation by mechanical irritation is diminished. At the same time the hyperæmia or metritis should be treated by bromide of potassium, ergot, absorbents, purgatives, local depletion, or other suitable means.

To arrest the tendency to formation of membranes, only such measures as tend to effect a profound alteration in the nutrition of the uterine mucous membrane are at all hopeful. Scraping the surface with the curette, followed by applications of iodine, carbolic acid, nitrate of silver, or nitric acid, may be tried for this purpose, but even nitric acid has failed to cure. Frequently it may be necessary to repeat the operation two or three times, at a not very long interval.

In obstinate cases, electrolysis is worthy of trial. In this case, if the use of the positive pole within the uterus does not effect a cure, it may be advisable to use the negative pole, provided there is no excessive hæmorrhage. The administration of arsenic has done good in some cases; and this drug appears to have some selective and alterative action on the uterine mucous membrane. Pregnancy is likely to modify the mucous membrane more than any other influence. In some slight forms of the affection I have found it to be apparently cured after pregnancy and delivery, to reappear after an interval of several years.

In the case of a sterile woman who suffers severely from the complaint, it may be advisable to consider the question of vaginal hysterectomy, or destruction of the endometrium by atmokausis.

HÆMATOMETRA.—Distension of the uterus with retained menstrual blood, which does not clot, as the result of congenital or acquired atresia of the genital canal, has already been described (pp. 122—129). A slighter degree of distension up to the capacity of an ounce or two, either with fluid blood or with clot, broken down or otherwise, is sometimes found in old women, years after the menopause, without any occlusion of the canal. There may or may not be some cause of partial obstruction, such as a retroflexion of the uterus. Hæmatometra, with considerable distension of the cavity, has been recorded in association with a broken-down fibroid and obstruction to the canal, probably due to adhesive inflammation.*

PYOMETRA.—The commonest cause of pyometra is cancer of the cervix uteri, which in some cases has begun within the cervical canal, and is not manifest on vaginal examination. Usually the cancer occludes or obstructs the canal, having previously led to infection of the interior by septic and sapric microbes. But in a case recorded by the author† there was no obstruction to the canal, the uterus measuring three inches in diameter.

A hæmatometra due to congenital or acquired occlusion may be converted into a pyometra if germs gain access to it. This generally results from rupture by a small opening externally or into some cavity, or from the congenital atresia not being quite complete, or leaving some tortuous canal of communication.

I have met with several cases of pyometra from senile endometritis, some years after the menopause, with retroflexion of the uterus. The same may result from stenosis of the canal, such as may follow upon supra-vaginal amputation of the cervix for cancer. In all these cases the pus is usually offensive, from the presence of the *Bacillus coli*, or other sapric microbe.

Treatment.—In pyometra resulting from cancer, hysterectomy, when practicable, is of course the only treatment. In the senile cases not associated with cancer, a cure may be effected by curetting and washing out the cavity, if the canal can be kept patent. If, however, the cure proves difficult, or the pyometra recurs, it is better to remove the uterus.

PHYSOMETRA.—A few cases have been recorded in which the uterus has been found distended and tympanitic, containing fœtid gas and pus. Most of them have been due to sepsis in pregnancy or the puerperal condition. Kelly‡ records two cases associated with sloughing fibroids, and one with pyometra due to cancer. The gas is supposed to be due to the action of the *Bacillus aerogenes capsulatus*.

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* See Hubert Roberts, "Outlines of Gynæcological Pathology," Fig. 15; and Meredith, "Obstet. Trans.," vol. xxix. p. 22.

† "Obstet. Trans.," vol. xxii. p. 239.

‡ "Operative Gynæcology," vol. i. p. 553.

CHAPTER VIII.

DISPLACEMENTS OF THE UTERUS AND PELVIC VISCERA.

RELATIVE IMPORTANCE OF DISPLACEMENTS OF THE UTERUS.

Both the importance and the non-importance of displacements of the uterus have been overrated by some authorities. Thirty years ago the tendency was rather to exaggerate their importance, owing to the teaching of a leading gynæcologist, that in the great majority of those cases which were formerly regarded as chronic inflammation of the uterus, an alteration in the shape or position of the organ is the principal and really important feature. Patients themselves, having been informed, or imagining, that they had a displacement, had their intention unduly directed to a trivial, or an entirely imaginary, disorder. Other authorities, in reaction, have gone to the opposite extreme of entirely disparaging the utility of pessaries, and teaching that in displacement of the uterus the truly scientific principle is to take care of the general symptoms, and to leave the displacement to take care of itself. The truth would seem to lie in the mean between these extreme opinions. It is as erroneous to regard as of little or no consequence all displacements of the uterus, with the exception of external and obvious prolapse, as to overrate the importance of anteflexion or anteversion.

The vogue of uterine displacements succeeded to that of so-called ulceration of the cervix uteri, and both have been to a great extent superseded in consequence of the better knowledge attained of the graver conditions of tubal and peritoneal inflammations, and their effects upon the uterus and its appendages.

Displacements of the uterus may be either the cause or the consequence of chronic hyperæmia, inflammation, or hyperplasia, and a further controversy has taken place on the question as to which is the usual sequence of events. Its most important bearing is the inference to be deduced from it as to treatment when the two conditions are found combined. There is no doubt that even when a displacement is, in the first instance, secondary to hyperæmia or inflammation, it has often a strong tendency to keep up and intensify the condition which gave rise to it; hence the general principle of action is that if the displacement is important in its degree and effects, and can be cured or alleviated by a pessary which is readily tolerated, it is best to have recourse to early mechanical treatment, in addition to other measures. This is usually the case in displacements of the uterus downward or backward. On the other hand, in the so-called anterior displacements, the position of the uterus either comes within the limits of its normal mobility, or but slightly exceeds them. Pessaries are therefore very rarely advisable in these cases.

There are some cases in which even a very acute flexion of the uterus is accidentally discovered, and in which no symptoms exist, just as there are some instances of extreme stenosis without any dysmenorrhœa. Minor degrees of displacement exist not infrequently without producing any symptoms. When symptoms are absent, treatment is, of course, unnecessary; and even when symptoms are present, it must not be too hastily assumed that the displacement is the cause of them, for it may be only an accidental concomitant. There is another class of cases in which treatment by pessaries is, as a rule, forbidden, namely, that in which the displacement is secondary to inflammatory adhesions or deposits, by which the uterus is firmly fixed. The question may then arise whether the adhesions should be broken down, either directly, after abdominal section, or by manipulation from the pelvis. But, unless this is done, a pessary generally fails to remedy the displacement, while it excites irritation by pressure.

Normal Position of the Uterus.—The uterus in a healthy and unimpregnated state is a very mobile organ, the whole of its body being free from any attachment except a very lax one by means of the broad and round ligaments—a provision necessary to allow of its expansion during pregnancy. The axis of the normal uterus varies from a straight line to a curve whose concavity looks forward, and whose angle does not exceed 60°. The maintenance of this axis during the movements of the uterus depends solely upon the firmness of the uterine tissue itself. If the tissue is firm, the uterus usually becomes anteverted when the bladder is empty; if it is lax, it becomes anteflexed. The chief supports of the uterus are, anteriorly, its attachment through the pelvic cellular tissue to the bladder, and, by its means, intermediately to the pubes, and, posteriorly, the utero-sacral ligaments, which run from nearly the level of the internal os, outward and backward, towards the second and third sacral vertebræ, forming the lateral boundaries of the pouch of Douglas (*see* pp. 15—17). Laterally, the centre of the uterus is also attached to the pelvic walls by the cellular tissue at the base of the broad ligaments. By these attachments its centre is rendered comparatively a fixed point, while the broad ligaments place scarcely any restraint upon backward or forward displacements of the uterine body, and only partially limit lateral displacements. The round ligaments have a certain function in drawing the fundus forward after displacement by distension of the bladder or otherwise, but are usually not on a stretch, and only tend to prevent extreme retroversion or retroflexion. The mean direction of the axis of the uterus is generally regarded as being coincident with that of the pelvic brim. It varies, however, considerably under different circumstances, and in different positions of the body, being inclined more anteriorly in the erect position, when the bladder is empty (Fig. 2, p. 5), and more posteriorly when the bladder is full, especially when the rectum is at the same time empty. Besides these movements upon a transverse axis passing nearly through its centre, the uterus as a whole is capable of a certain amount of upward and downward movement, in which movement the base of the bladder and the pelvic cellular tissue which forms the floor of the abdominal cavity necessarily partake. These occur, to a certain extent, in respiration, and still more in any forcible effort. In Fig. 142, p. 269, and in the other figures illustrating displacements of the uterus and the position of pessaries, the vagina is represented, for the sake of clearness, as forming an actual cavity. This is not, however, its condition in the living woman, except when its walls have been separated by the introduction of the finger or an instrument, or unless air has entered in the prone or semi-prone position. It is normally flattened, so that the anterior and posterior walls are in contact, as indicated in Fig. 2. Its direction is nearly at right angles to the axis of the pelvic brim, and thus the anterior vaginal wall, receiving through the bladder the intra-abdominal pressure, which acts somewhat in the direction of the axis of the brim, is supported by the posterior vaginal wall. In the case of rupture of the perineal body, the lower half or lower third of the anterior vaginal wall becomes unsupported, and a tendency to bulge commences at this part.

It is most correct to regard the floor of the abdominal cavity to be formed by the plane of cellular tissue, nearly parallel to the pelvic brim, including the anterior vaginal wall, and the utero-sacral ligaments, of which the supra-vaginal cervix uteri is the centre. This most directly receives the effect of the intra-abdominal pressure. The diaphragm at a lower level, made up of strong muscular structures, of which the levator ani is the chief, and which is commonly described as the pelvic floor, does not directly receive the impact of intra-abdominal pressure, but has an important function in supporting the upper diaphragm or abdominal floor, or, as it is sometimes called, the pelvic roof.

It is usual to describe an anterior and a posterior pelvic triangle. The anterior has its base at the pubes, its apex at the anterior wall of the cervix uteri, and corresponds to the anterior half of the upper diaphragm or abdominal floor. The posterior triangle has its base at the sacrum and coccyx, its apex at the anterior edge of the perineum, and corresponds to the main part of the lower diaphragm or pelvic floor. In parturition the anterior triangle has its apex drawn upward, while the posterior triangle has its apex driven downward. The two thus open like folding doors opening in opposite directions, to let the fœtus pass through. In the normal condition the two lie in apposition overlapping each other, the posterior being the strongest and supporting the anterior (*see* Fig. 2, p. 5).

The pressure of the intestines has an important influence in maintaining or modifying the position of the uterus. Being made up of that of the individual coils, it is not equable on all sides, like a fluid pressure, but is apt to be greatest where the coils are largest or most numerous. This is usually the case in the retro-uterine fossa of the peritoneum, which is more capacious than the space in front of the fundus (*see* Fig. 2, p. 5), and hence the intestinal pressure is an important element in maintaining the normal anteversion of the uterus, the bladder being empty, in reference to the axis of the brim. The uterus does not normally depend upon the vagina or perineum for its maintenance in place, and it may remain in position even though the perineal body is extensively destroyed. But there is naturally a tonic muscular constriction of the vagina, especially in the lower half. This is due mainly to the action of the anterior fibres of the levator ani, which are attached to the back of the pubes in front and encircle the vagina, blending with its muscular wall (*see* Fig. 4, p. 8).

This part of the levator ani forms the real sphincter of the vagina, and to it is due the normal convexity forwards of the posterior vaginal wall (*see* Fig. 2, p. 5), and the firmness of this portion of the vagina felt on digital examination. The muscle called sphincter vaginæ is weak and superficial, and has comparatively little effect. When a tonic muscular contraction of the levator ani exists, it must offer a resistance to any considerable descent of the cervix. When muscular tonicity is lost, and especially when the perineal body has also been lacerated in parturition, the vagina often becomes an active agent in producing prolapse.

Causation of Displacements in General.—Displacement of the uterus may be produced by any influence which tends to increase the weight of the organ, to weaken its supports, to push or to drag it out of place, or to diminish the firmness of the uterine tissue itself, the last element coming into play specially in the causation of flexion. Increased weight is most commonly due to the presence of fibroid or other tumours, to subinvolution or hyperplasia of the whole or a part of the uterus, to hyperæmia, or to pregnancy. Causes tending to weaken the uterine supports may be a general want of nutrition and laxity of tissue, associated with feeble health, especially if combined with a deficiency of fat. The most important, however, are the effects of pregnancy and parturition, including not only a stretching and loss of tone of all the uterine ligaments and of the vagina, but frequently also more or less damage to the perineal body. These are conjoined with excessive weight of the uterus, so long as involution of that organ remains incomplete; and thus a too early getting-up, or undue exertion too soon after delivery, is the commonest of all causes of serious displacement. Among external causes are the effects of muscular efforts or falls, which may produce sudden displacement of an organ previously healthy. This, however, is comparatively rare; while a gradual effect, produced by prolonged muscular exertion in the standing position (as in the case of laundresses), or by repeated efforts of any kind, as chronic cough, or straining in habitual constipation, is much more common.

The most widely prevalent of all causes is the increase of abdominal pressure produced by the wearing of corsets. In women who lace tightly, this excess of pressure is constantly present, and tends to depress the uterus and the whole pelvic floor. Even in women who consider that they wear their corsets very loose, the circumference allowed is generally two or three inches less than that which would be sufficient for full expansion of the abdomen in deep inspiration. Hence the effect of any complete descent of the diaphragm on exertion is expended, not in expanding the abdomen, but in depressing the pelvic outlet, and with it the uterus, tending to cause prolapse, retroflexion, or anteflexion, according to the position of the uterus at the time, and the condition of its ligaments. The weight of heavy skirts hung from the waist without corsets has a similar effect; while, if worn over corsets, they add to the pressure of the corsets. Thus, it is often to be noted that girls begin to suffer from dysmenorrhœa or other pelvic trouble about the time when they begin to wear long dresses, and pay more regard to their figure.

Among the most irresistible forces tending to displacement are those exerted by tumours, effusions of fluid, inflammatory deposits which push the uterus, or contracting adhesions which pull it, from its place.

Undue softness of uterine tissue is a predisposing cause of flexions. It may result simply from imperfect nutrition—a condition most common in girls about the age of puberty, as the effect of insufficient or unsuitable diet, or imperfect digestion, especially when associated with a too sedentary life and lack of sufficient air and exercise. In the earlier stage of uterine hyperæmia or chronic metritis, the uterus is soft as well as increased in bulk, and therefore prone to flexion; while in the later stage it becomes indurated. Softness of the uterus also exists after parturition, and any cause which interferes with involution also prolongs the softened state of the organ.

RETROVERSION AND RETROFLEXION OF THE UTERUS.

Pathological Anatomy.—In pure retroversion the uterine axis is straight, but the whole organ is tilted backward, so that the fundus is inclined toward the sacrum, and the os toward the pubes. Retroversion is possible through a very large angle, and is not infrequent up to one of about 135° (Fig. 141, p. 268). In the case of the gravid uterus, at the third or fourth month, even this may be exceeded, and the angle of retroversion almost 180°, so that the fundus presses down upon the perineum, bringing down with it the retro-uterine pouch of peritoneum, and distending the recto-vaginal septum.

In retroflexion the axis of the uterus is bent upon itself, so as to create a curve with its concavity looking backward.

The curve is generally not uniform, but has a point of maximum curvature usually near the internal os, where the uterine wall is naturally thinner and more pliant. In pure retroflexion the direction of the os uteri may be unaltered, but more frequently retroflexion is combined with more or less of retroversion, so that the axis of the uterus is carried backwards, while at the same time the os is tilted forwards (Fig. 142). In primary retroflexion, on the other hand, the os may look too much backwards, as in anteversion. In a recent flexion of the uterus, whether backwards or forwards, the uterine wall on the convex side of the curve becomes the thinner as the result of stretching, exactly as would be the case with an india-rubber tube. In pathological specimens from old cases of flexion, however, it is often found that it is the wall on the concave side which is attenuated. This may be the result of atrophy from the prolonged effect of pressure and interference with the circulation, or may depend upon the flexion having been in the first instance due to a failure of development in the anterior or posterior wall of the uterus. The occasional existence of such a condition explains the great difficulty sometimes found in preventing the return of the uterus to its former shape after it has been straightened.

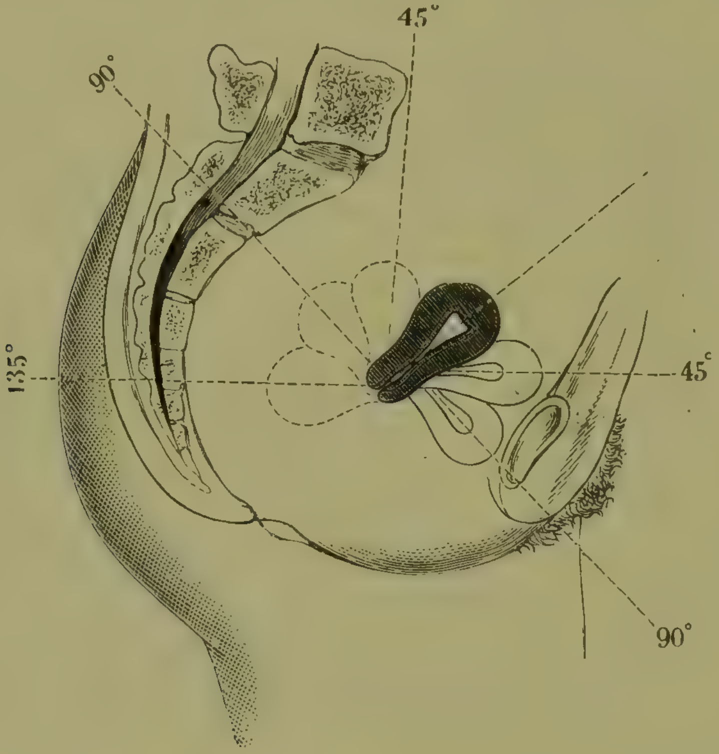

Fig. 141.
The Degrees of Retroversion and Anteversion.

Retroversion and Retroflexion of the Gravid Uterus will not be discussed here, since they are considered in works on midwifery.

Causation.—The predisposing causes are the same as those enumerated for displacements in general. Retroversion is especially associated with prolapse, since the uterus as it descends tends to follow the curved axis of the pelvis, the cervix moving downward in the line of the vagina, the direction of least resistance (Fig. 156, p. 299). The causes of prolapse, therefore, almost invariably produce at the same time more or less retroversion. Retroversion may also be brought about by the effect of gravity if the dorsal, or dorsal reclining position (as in an easy chair), be too persistently maintained, especially when the uterus is heavy, as after parturition, or from the effect of subinvolution or hyperplasia. Such an effect may be increased by over-tight bandaging. A similar effect may result from the prolonged and excessive distension of the bladder to which women are especially liable, a temporary and partial retroversion being a necessary result of this distension. If a muscular effort is made under these conditions the retroversion may be suddenly increased.

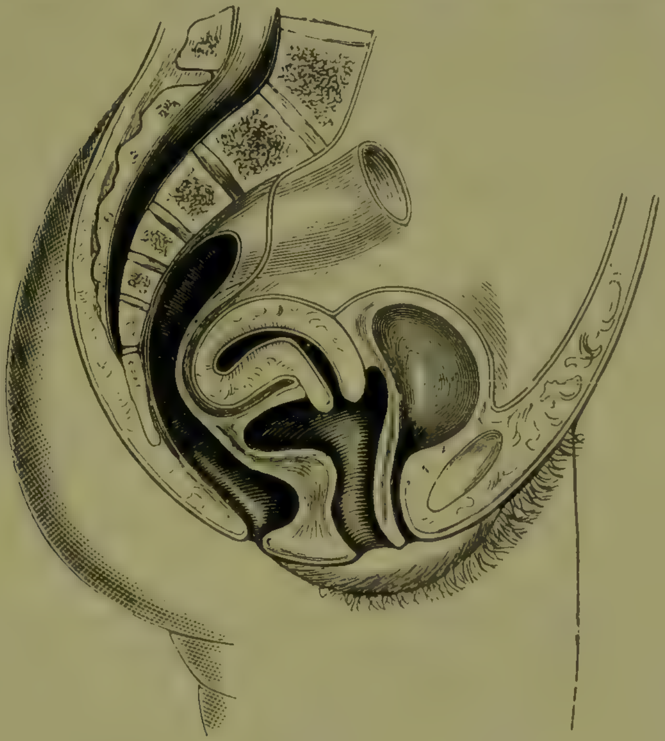

Fig. 142.
Retroflexion of the Uterus with associated Retroversion.

Retroflexion is, in rare cases, a primary affection, being due to defective development of the posterior uterine wall, either in fœtal life or at the time of puberty, when the organ is the subject of rapid growth. In the great majority of cases, however, it is secondary, and it is generally developed out of a partial retroversion, with descent. This may be partly the effect of gravity, and partly that of intra-abdominal pressure acting either gradually or during muscular efforts. When retroversion exceeds an angle of about 55° the weight of the body of the uterus itself, in the standing position, begins to tend to increase the retroversion or convert it into a retroflexion, instead of tending to bring the fundus forward as in the normal condition (*compare* Fig. 141, p. 268 *with* Fig. 2, p. 6). In the sitting or reclining position this effect comes into play at a less angle than 55°, the pelvic inclination being then much diminished. Again, when partial retroversion exists, there is more room for coils of intestine in front of the fundus than behind it, and thus the intestinal pressure, which normally should keep the fundus forward (*see* p. 265), comes to act upon its anterior surface, and press it down into the hollow of the sacrum. Thus is brought about, if the uterus is rigid enough, an increased retroversion; but if it is soft, the retroversion is converted into retroflexion. Retroflexion may also be produced by the weight of a small fibroid tumour in the posterior uterine wall.

Results and Symptoms.—Versions of the uterus, unless of extreme degree, produce comparatively little effect upon the uterus itself, the symptoms being chiefly those due to dragging of ligaments or pressure on neighbouring structures, and those which belong to associated hyperæmia or inflammation. A flexion, when primary, may have little or no effect of any kind, for the uterine canal is then adapted to the curve of the uterus, and its calibre need not be diminished. When, however, a uterus, originally straight, or nearly so, becomes flexed, there is necessarily a tendency for its canal to become flattened, just as would happen with any tube of soft material. This will be more marked if, as is often the case in acquired flexion, the curve is not uniform throughout, but sharper near the junction of body and cervix, where the muscular walls are less thick than those of the body. The flexion may then have a double effect upon the uterus. First, the exit of the menstrual fluid and mucus is rendered less free, especially if the calibre of the uterine canal is below the average. In such cases dysmenorrhœa may be produced, if the menstrual discharge is not perfectly fluid, and the uterus become enlarged from hypertrophy of muscular tissue to overcome the stenosis. Conception may also become less easy; and, on account of the retention of secretion, any endometritis which may arise is more persistent. Retroflexion promotes endometritis more than anteflexion, because, when there is retroflexion to the degree shown in Fig. 142, p. 269, gravity is against the drainage of secretion from the fundus uteri, both in the upright and reclining position of the woman. In anteflexion, gravity must aid drainage in the supine position in any case; and in the erect position, unless the anteflexion is considerable and the bladder empty.

That retroflexion does predispose to endometritis and retard recovery from it, is proved by the fact that in elderly women, long after the menopause, there is sometimes found to be an offensive purulent discharge from the uterus, without any other apparent cause than a retroflexion. The uterine cavity is partially distended by the discharge; and the condition is curable by keeping the uterus in place with a pessary. This effect does not occur during the active period of sexual life, for the uterus does not allow itself to be distended through a slight impediment until its active muscular contractility is lost or impaired.

Some gynæcologists have attached importance to compression of the veins through the bending of the uterus, and consequent hyperæmia, vulnerability to slight exciting causes of inflammation, and sometimes menorrhagia. The vessels, however, do not enter the uterus and run longitudinally in its walls, so that a sharp bend near the internal os would interfere with the return of blood from the fundus. They divide into branches in the cellular tissue of the broad ligaments, and these branches encircle the uterus in horizontal loops (*see* pp. 24—26). Thus the arrangement of vessels is such that flexion will produce the least possible effect upon the circulation. Venous return can only be interfered with at the level where the bend exists and tissue is compressed. Any venous impediment due to displacement depends, therefore, less upon flexion in itself than upon a strain or drag upon the cellular tissue of the broad ligaments. This will chiefly occur when the fundus is displaced much backward, or below its normal level, and is due more to the version and descent than to the flexion.

All these effects are greatly enhanced if there be a tendency to hyperæmia or endometritis, independent of the displacement, and may be entirely absent in some cases in which the uterus is quite free from congestion, and the vessels have had time to accommodate themselves to the altered position. Another cause for passive hyperæmia in retroflexion is that the enlarged fundus, pressed down into the hollow of the sacrum, rests between, and may be compressed by, the utero-sacral ligaments at either side, while the vessels at the side of the uterus are bent over the edge of these ligaments. Menorrhagia is, therefore, not uncommonly associated with retroflexion, especially if the displacement is extreme in degree. Strangulation by the pressure of the utero-sacral ligaments is not, however, the sole cause of symptoms in retroflexion, for symptoms may exist, and be relieved by the use of a pessary, when the fundus can, without difficulty, be pushed up by the finger in the vagina. Since some degree of descent of the fundus below its normal level is hardly ever absent in retroversion or retroflexion, a dragging pain, from tension of the uterine attachments, is one of the most frequent symptoms. In general the amount of discomfort or pain present is largely dependent upon the degree of prolapse associated with the retroflexion or retroversion. It may be entirely absent in cases of congenital retroflexion, or others in which the uterus lies near its normal level and there is no accompanying endometritis. Adhesions are occasionally produced by a partial peritonitis, and the fundus then becomes tethered in a backward direction. If a retroflexed or retroverted uterus becomes pregnant, the fundus may become incarcerated in the pelvis, generally about the third month, or shortly after. Abortion may then follow, or danger may arise from retention of urine and consequent inflammation of the bladder.

Many of the other symptoms of retroversion and retroflexion are common to most uterine maladies, being due to associated hyperæmia, endometritis, or metritis. Among such are pains extending down the thighs, digestive disturbances, hysterical manifestations, or, in hysterical subjects, functional paralysis. The most marked form of pain, however, in retroversion, and still more in retroflexion, is pain over the sacrum, increased in defæcation. The pain in defæcation is due to pressure on the tender fundus, which, when the displacement is considerable, encroaches on the calibre of the rectum (Fig. 142, p. 269). It is often associated with rectal tenesmus and excessive secretion of slimy mucus from the rectal mucous membrane. Frequently, also, there is obstinate constipation, partly due to the degree of mechanical obstruction existing, partly to the pain in defæcation. In both forms of displacement coitus becomes a mechanical cause of inflammation, especially in retroversion of about 90°, when the cervix lies almost directly in the line of the vagina, and is usually, also, too low down (Fig. 141, p. 268; Fig. 156, p. 299), and so becomes exposed to a direct impact, to which it is not normally subject. The bladder is affected less in retroflexion than in retroversion, when the pressure of the cervix may cause irritability, or, if the uterus be enlarged by tumour or by early pregnancy, may lead to retention of urine, which is the most characteristic symptom of retroversion of the gravid uterus.

Diagnosis.—In retroversion the os is found on vaginal touch to be tilted forwards, often so much so as to look in the direction of the vagina, or still more anteriorly. By bimanual examination the absence of the fundus from its normal position is ascertained, the external hand coming close down upon the finger in the vagina. More or less of the body of the uterus is felt by the finger behind the os, but without any concavity or angle between it and the cervix. It may be made to move in conjunction with the cervix, unless fixed by adhesions, and, if necessary, the diagnosis may be confirmed by the sound, introduced with its concavity looking backward.

In retroflexion the os may look in the normal direction, or even too much backward, but is more frequently more or less tilted forward, some retroversion being associated with the retroflexion. The fundus is absent from its normal situation, and is felt behind the os as a rounded tumour with a concavity between it and the cervix. It is found to move with the cervix, and is so distinguished from other lumps which may be felt through the posterior vaginal fornix. If rigidity of muscles, distension of the abdomen, or the presence of inflammatory or other swellings, makes it impossible to ascertain the presence or absence of the fundus in front on bimanual examination, the diagnosis becomes more difficult. It may often be effected with the finger alone, by tracing the continuity between fundus and cervix, and their conjoint mobility, but the sound here affords decisive information. Its use, however, should be avoided, as a rule, if active inflammation be present. If the os looks in a normal direction, the sound, which has been previously bent to a curve nearly as great as that which the uterine axis is supposed to have, is introduced with its concavity at first forward, and, when it has reached the internal os, is reversed by a *tour de maître*, the converse of that previously described (*see* Fig. 23, p. 35). It is then passed on to the fundus by carrying the handle far forward if necessary, and at the same time pushing up the fundus by the finger in the vagina. If the os is tilted forward, however, the concavity of the sound should be directed backward from the first. If the fundus be restored by the sound, in the mode described under the heading of treatment, the swelling will disappear behind the fundus. The most difficult cases for diagnosis are those in which the fundus is involved in, or adherent to, fibroid or other tumours or inflammatory swellings, and in such cases the sound alone can usually afford certain results. A small fibroid in the posterior uterine wall is apt to be very misleading, especially since it generally produces more or less retroflexion. The diagnosis must then be made by completely restoring the uterus with the sound, and then observing whether the swelling previously felt behind the cervix has entirely disappeared.

Treatment.—If displacement is discovered accidentally, in the absence of symptoms, no treatment is called for. But in patients who have formerly had symptoms, cured by the treatment of the displacement, it is sometimes advisable, if the displacement is found to be recurring, to resume treatment before symptoms are again produced.

In the slighter degrees of backward displacement, not accompanied by much descent, especially those which occur in single women, the uterus not being enlarged, or after the menopause, when the uterus is atrophied, mechanical treatment may be unnecessary. The need for keeping the uterus in place is greater the more the fundus is enlarged, and the lower it descends into the posterior cul-de-sac. Hence, in the majority of cases of retroversion or retroflexion of any notable extent, excepting those in which the displacement is secondary to peri-uterine inflammation, it is desirable to commence the treatment by replacing the uterus, and maintaining it, as far as possible, in position, after which remedies for the relief of any coincident hyperæmia or inflammation are likely to be much more effectual. This depends upon the fact that the displacement can generally be rectified in a more or less complete manner by some form of Hodge's pessary (Fig. 143), which can usually be tolerated even when the uterus is tender. The mechanical action of this pessary, which is sometimes termed the lever pessary, is two-fold. In the first place, its posterior limb stretches the posterior vaginal cul-de-sac backwards and upwards (Fig. 144, p. 276), and thereby draws the cervix backward and tilts the fundus forward. The uterus itself may here be regarded as a lever, the fulcrum being at its centre, and the power applied to the cervix. This mechanism therefore tends to remedy retroversion, but has no direct effect upon retroflexion. The second action is that by which the posterior limb, when sufficiently long and curved upwards, directly pushes up the displaced fundus, or, more frequently, prevents its return when it has been restored by other means (*see* dotted outline in Fig. 144). The pessary is here the lever: the fulcrum is a transverse axis, somewhat above its centre, upon which it is capable of oscillating as it is grasped by the vaginal walls: the power is the pressure of the anterior vaginal wall upon its anterior limb, greatly increased during any expulsive efforts: the weight, or resistance, is the fundus uteri, which is pushed up by the posterior limb. Some authorities have denied the latter action, and have maintained that the pessary is useful only in retroversion and not in retroflexion. If this were the case, a rather flat pessary would be the best, as most efficacious in drawing the cervix backward. Experience, however, shows that a pessary with a long and strongly-marked sacral curve often succeeds in retroflexion when a flatter one has failed.

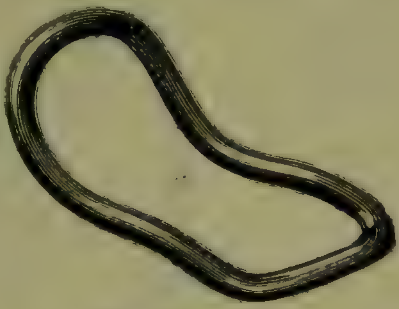

Fig. 143.—HODGE'S Pessary.

By saying that the pessary acts as a lever, it is not meant that the posterior end is actually tilted upward when the lower end is pressed downward by an expulsive effort. Both ends descend to some extent; but the resistance to the downward pressure at the posterior end is about double that at the anterior end, because the basis of support (or fulcrum) against the recto-vaginal septum is much nearer to the posterior than to the anterior end. Similarly, in a position of rest, the upper end of the pessary transmits to the posterior fornix from the posterior vaginal wall an upward pressure about twice as great as that of the lower end on the anterior vaginal wall.

It is impossible, however, for the pessary directly to push up a retroflexed uterus completely into its normal position, and when it is acting in the most successful manner the fundus will be found no longer in contact with the posterior limb of the pessary

(Fig. 144). This depends upon two causes: first, that the fundus can be pushed up to such an extent that the weight of the uterus itself in the standing position will tend to remedy instead of to aggravate the displacement (*see* dotted outline in Fig. 144); secondly, that when the coils of intestine have once been allowed to come down into the retro-uterine fossa of the peritoneum, they resume their normal function of pressing chiefly upon the posterior surface of the uterus, and so tend gradually to reduce any retroflexion. Thus, of the two combined displacements, retroversion and retroflexion, the pessary directly remedies the retroversion, while the changed intra-abdominal pressure gradually overcomes the retroflexion. Short of this result, however, the pessary may do good by directly supporting the fundus, especially in cases of fibroid in the posterior uterine wall.

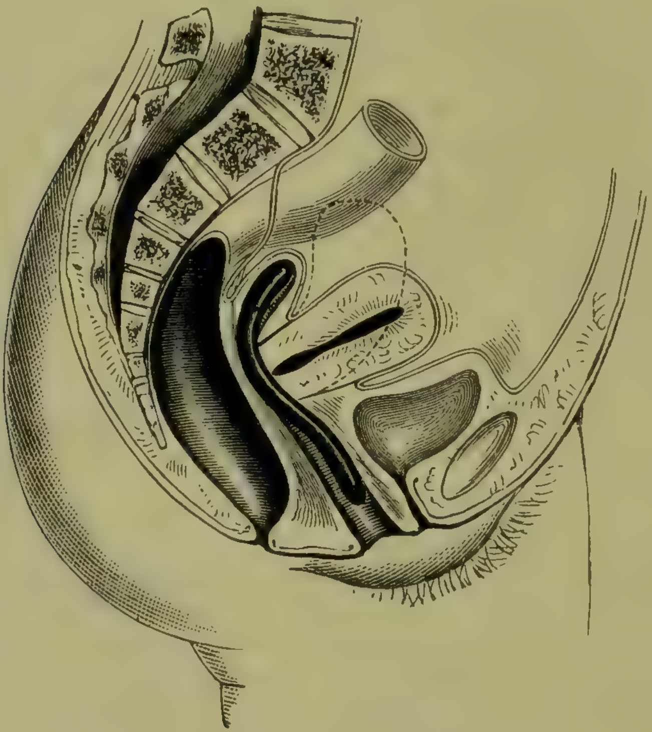

Fig. 144.
Hodge's Pessary in Position

Hodge's pessary has been made in many different shapes, and various names have been applied to these. That most generally useful is shown in Figs. 143 and 144. The upper or sacral curve is considerable; the lower or pubic curve is slight, and only just sufficient to distribute the pressure equally over the anterior vaginal wall. The lower extremity is square in the centre, but well rounded at the corners. The whole instrument should be made thick, the bar being nearly $\frac{3}{10}$-in. in diameter, that its pressure may be more easily borne. There is then no risk of ulceration being produced, even if the pessary is neglected, provided that the fit is suitable originally. When in place it should not rest against the pubic rami, or any bony support, but be held by the elastic vaginal walls. It should be possible easily to pass the index finger between the pessary and the pubes.

It will be convenient here to speak of the materials used in the construction of pessaries in general. The best of all is vulcanite, since it is light, smooth, and non-absorbent, and can readily be bent to any shape. The bending may be effected by placing it in hot water, not far short of the boiling-point, and afterwards plunging it in cold water when the desired shape has been given. Another method is to oil the surface, and then to move the instrument rapidly backward and forward through the flame of a spirit-lamp, till it is sufficiently softened. The latter mode is more convenient for bending one part of a pessary at a time, but a little practice is required to avoid burning the surface, and so spoiling its polish. Celluloid or xylonite is also a good material, but has one disadvantage, namely, that it cannot be moulded by the spirit-lamp, but only in hot water. Hodge's pessaries are also made of pewter tubing, which can be bent by the hand. These answer very well, but they are rather heavier than vulcanite, are apt to separate at the point where the tubing is joined, and are not quite so perfect in cleanliness. A pliable form of celluloid has also been introduced. Pessaries may be made hollow in platinum or aluminium, when the exact shape required is known, but these cannot be moulded to suit altering requirements. Of all materials gutta-percha is the worst, since it rapidly becomes roughened, and sets up irritation. India-rubber is far preferable to gutta-percha, but, being somewhat absorbent, it retains the secretions, and so is apt, before long, to become offensive, and often to produce some vaginal irritation.

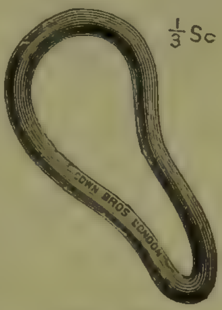

Fig. 145.
Albert Smith's Pessary.

Any form of Hodge's pessary may be regarded as acting as a splint to keep the vagina in its natural position, and so prevent displacement of uterus as well as vagina. But there are two forms of it which adapt themselves to this function still better than that shown in Fig. 143, p. 275, since they approximate more closely to the natural shape of the vagina, resembling a triangle with the base uppermost. If the other form is found to get displaced by turning sideways, one of these should be tried. The first is known as Albert Smith's pessary (Fig. 145, p. 277). The lower end is comparatively pointed, but should not be curved too much downward, otherwise it forms an obstruction to coitus, and is thus an inconvenience to married women; while the pessary shown in Fig. 145 should rest completely behind and above the apex of the pubic arch. This is a point deserving of attention, since the great advantage of Hodge's pessary is that it does not prevent coitus, but may lead to conception when sterility had previously existed. Thomas's pessary (Fig. 146) is faulty in this respect, but may be used in widows or unmarried women. Its shape is an exaggeration of that of Albert Smith's pessary. The lower pointed end is curved much downward, to avoid pressure on the urethra, and rests lower down than that of other forms of pessary, between the pubic rami, so preventing rotation. The upper end is made very bulky and high, so as to prevent the return of the fundus by its actual bulk, and distribute the pressure on the vaginal wall, and so prevent its cutting the mucous membrane.

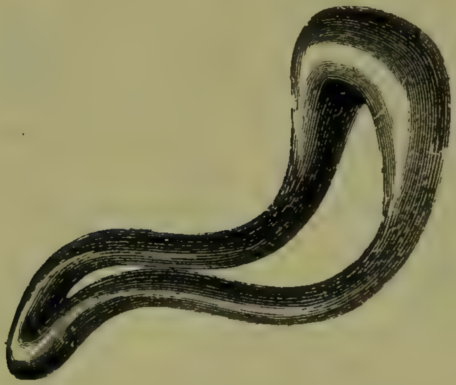

Fig. 146.
THOMAS's Retroflexion Pessary.

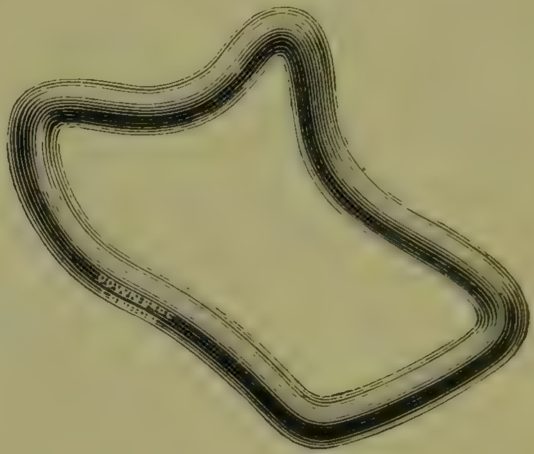

Fig. 147.
GERVIS's Pessary.

The second form of pessary which, from its approximation to the natural shape of the vagina, rarely turns sideways, is Gervis's pessary (Fig. 147). The upper end is much wider than the lower. At the top there is a central depression, intended to receive the fundus and preventing its slipping to one side. It is therefore very useful for those cases in which the uterus can only be partially restored. But the object should always be to bring the fundus forward, away from contact with the pessary, as shown in Fig. 144, otherwise the displacement can never be cured in the sense that the pessary may eventually be discarded, and the uterus remain in place.

Gervis's pessary being relatively short, its lower end lies high up behind the pubes. It is therefore suitable for married women who find other forms inconvenient in coitus. From the fact of the lower end being turned upward, it is often useful for early cases of descent with cystocele.

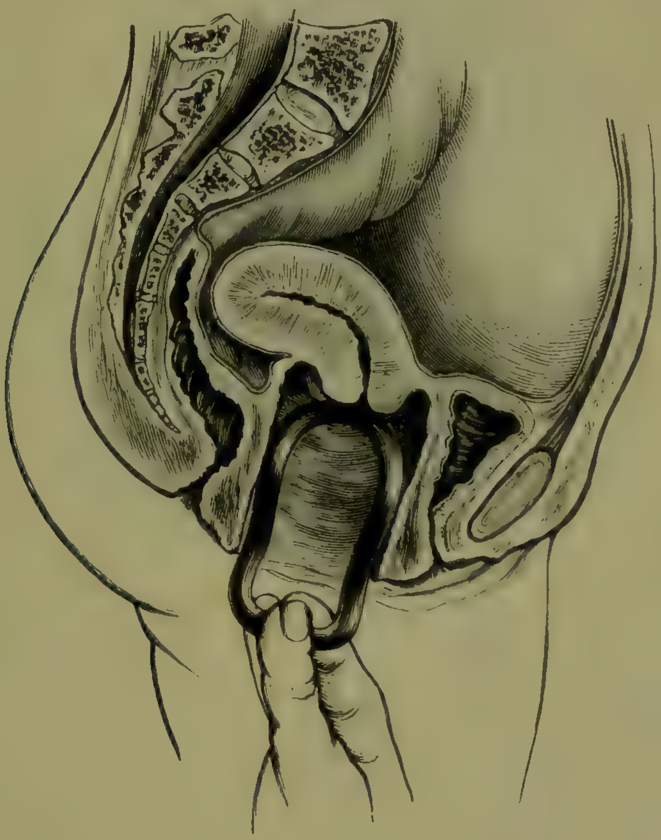

Fig. 148.
First Stage in the Introduction of Hodge's Pessary.

In Greenhalgh's pessary, to avoid interference with coitus, the instrument is made of somewhat elastic wire covered with rubber tubing, the wire having a gap in the centre of the lower end, so that here there is nothing but the rubber tubing, and the lower corners can be pressed together during introduction. It has, therefore, a disadvantage in point of cleanliness, and the india-rubber becoming very soft in the vagina, the unsupported corners are apt to press injuriously. I have met with several instances in which they had ulcerated very deeply into the vaginal walls.

In some instances, where there is considerable hyperæmia, swelling, and tenderness of the fundus, as is the case more frequently in retroflexion than in retroversion, it is desirable, before attempting to use a pessary, to treat these conditions by rest for a few days in bed, with saline aperients and sedatives, and sometimes local depletion. Recourse should always be had to the same plan when a pessary has been tried, but cannot be tolerated on account of the pressure which it exerts upon the fundus.

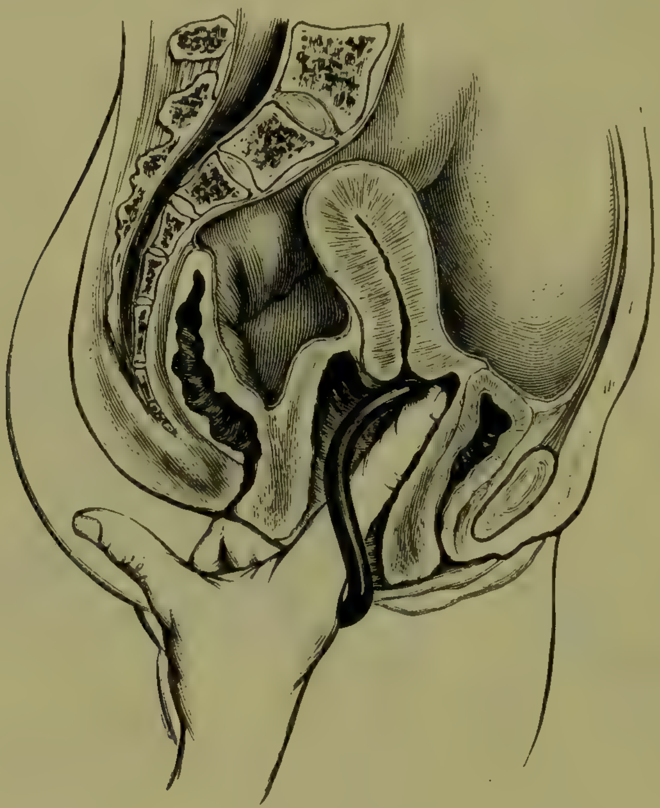

Fig. 149.
Second Stage in the Introduction of **Hodge**'s Pessary.

Meanwhile the uterus may be kept in place to a certain extent by vaginal tampons of absorbent cotton soaked in carbolized or iodized glycerine, with a thread tied round them for withdrawal. After restoration of the uterus, a small tampon is pressed up into the posterior fornix, behind the cervix, to prevent the fundus descending so low as before, and a much larger tampon is placed in front of the cervix, to fill the lower part of the vagina, and press the cervix backward. The effect of the glycerine is to promote a watery secretion from the uterus, and so diminish congestion.

If the Hodge's pessary, after such treatment, still cannot be tolerated, the elastic ring pessary of watch-spring covered with india-rubber, which will be described as one of the best pessaries for prolapse, often proves useful, at least as a temporary resource. It counteracts the descent and retroversion, though it rarely completely remedies retroflexion.

Before a pessary is inserted, the uterus should be replaced, if possible, by the finger. This may be done in the lateral or, what is better, the semi-prone position. By one or two fingers, the perineum is retracted, air allowed to enter the vagina, the fundus pushed upwards, and the cervix, if it looks too much forward, is afterwards drawn backward. Sometimes the external hand above the pubes may assist in bringing the fundus completely forward. For this, the patient is placed in the dorsal position; the fingers in the vagina first raise the fundus as far as possible, then push the cervix very far back, while the external hand, pressed deeply in a little below the umbilicus, endeavours to get behind the fundus, and bring it forward into anteversion. The introduction of a Hodge's pessary itself will often effect or complete the restoration of the uterus. For its adjustment, the patient is placed in the left lateral or semi-prone position, and the pessary is turned edgewise, until it has more than half passed through the vulva (Fig. 148, p. 279), the perineum being meanwhile retracted by a finger of the left hand, and the pessary directed rather backwards, to avoid pressure on the symphysis. It is then rotated in the direction which it is to occupy, having the concavity of its upper or sacral curve looking forwards. The index finger of the right hand is then introduced behind the lower limb, and passing through the pessary, hooks the upper limb backward over the cervix, and, at the same time, pushes it upward into the posterior cul-de-sac (Figs. 149, 150). This mode of passing the index finger through the pessary, and behind its lower end, at the stage at which the pessary is half introduced, is the most essential point about the correct mode of introduction, and should be specially noted. The upper limb always tends to run up in front of the cervix, and, when the pessary has a strong sacral curve, it may be difficult to overcome this tendency. It is then often useful not to rotate the pessary completely into its destined direction, but to hold it somewhat diagonally, until the upper limb has passed behind the cervix.

The pessary should cause no pain when once in position. If it does so, it is a sign that it is too large, too angular, or improperly adjusted, and it should at once be removed. A Hodge's pessary should always fit sufficiently loosely to allow the index finger to be passed without difficulty between its lower limb and the pubes.

In adjusting or replacing a pessary, the inexperienced should note that, if the pessary is wider at one end than at the other, the wider end is intended to lie uppermost, with the concavity of its curve forwards. If the two ends are equally wide, that having the greatest curve should lie uppermost, and the concavity of the curve look forward. If the pessary is introduced with its curve reversed, as is sometimes the case, the upper end presses injuriously on the rectum instead of curving away from it.

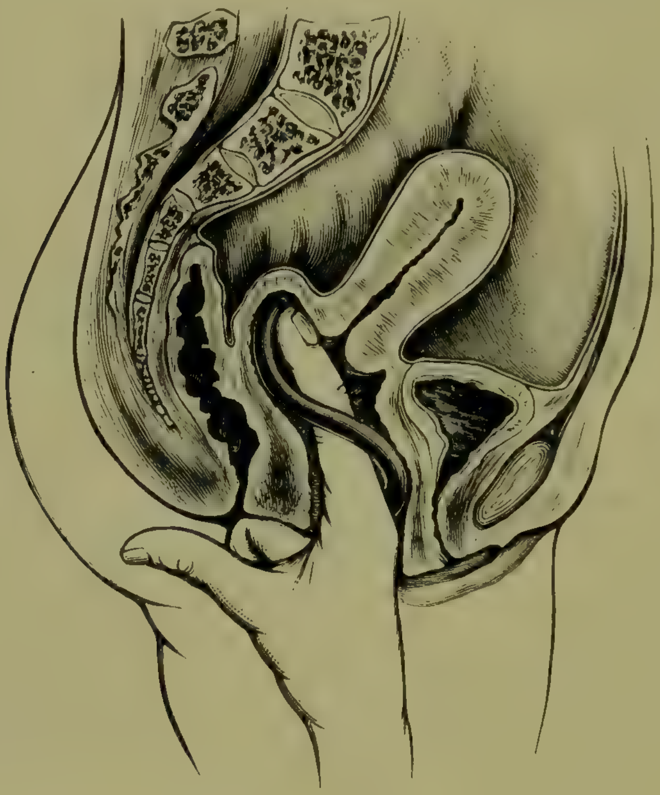

Fig. 150.
Third Stage in the Introduction of Hodge's Pessary.

If in a case of retroflexion the fundus can be restored to a considerable degree by these means, the pessary may be left gradually to bring about a more complete reduction, and its leverage action is more effective when the patient is up and about than when she is confined to bed. In retroversion, also, such treatment will rarely fail. It sometimes happens, however, in retroflexion, either that the pessary fails to raise the uterus at all, and only exercises painful pressure upon it, or that its upper limb fits it to the concavity in its posterior surface, and merely elevates the whole organ, while the fundus remains flexed over the pessary. It is then necessary, in the first place, to restore the uterus by other means, if the bimanual method, mentioned in the preceding page, does not succeed. Of these the chief are: (1) pressure *per rectum*; (2) the postural method; (3) the use of the sound as a repositor.

(1.) Pressure by the finger on the fundus from the rectum is more effectual than by the vagina, since the leverage is greater, and it may sometimes be conveniently applied when the uterus is found incompletely restored after adjustment of a pessary.

(2.) In the postural method the object is to place the patient in such a position that the inlet of the pelvis looks vertically downward, the abdominal muscles are relaxed, and the weight of the abdominal contents tends to produce a negative pressure in the pelvis. If air be at the same time allowed to enter the vagina, by separating the labia, if necessary, the vagina becomes distended into an actual cavity, the uterus recedes, and the fundus may be restored by this means alone, its own gravity assisting in some small measure. The recession of the fundus may also be assisted by pressure from one or two fingers in the vagina or rectum. Sometimes, however, the fundus merely recedes out of reach, the retroflexion or retroversion remaining unrectified, and the third method is then the only effectual one. This is generally the case, if the uterus is not already restored to some considerable extent, before the postural method is adopted. In carrying out the postural method, the patient may be placed in the knee-elbow or genu-cubital position on a hard bed or sofa. Care must be taken that the thighs are exactly vertical, and the chest low. In this way the axis of the trunk may be inclined as much as 35° to the horizon, the hips being higher than the shoulders—a position which will give the best results, taking the normal pelvic inclination as 55°. Some authorities reject the knee-elbow, and are content only with the genu-pectoral or knee-chest position. Most persons, however, will find, if they try the experiment of kneeling in this position on the floor, that it is impossible to touch the same plane with the chest. Moreover, to increase the inclination of the trunk beyond 35° would diminish the efficacy of the position. It is often of use, in retroflexion or retroversion, to instruct patients themselves to adopt this position once or twice a day, as well as to lie, as far as possible, in the prone or semi-prone position when in bed.

(3.) The use of the sound as a repositor is the most effectual of all methods, but is not so safe as the two already mentioned, unless both caution and dexterity be employed. Those, however, who possess the necessary skill will generally be able to restore the uterus in this way with much less discomfort to the patient than by either of the other means. It is a necessary condition that the fundus uteri should not be fixed backward by adhesions due to perimetritis. The sound, first carefully sterilized, has its intra-uterine portion made nearly straight, and is introduced in the mode already described, the handle being necessarily carried far forward, and the point directed backward. If it can only be introduced by giving it an increased curve, it should be withdrawn, and introduced a second or third time with a gradually diminished curve, so rendering the axis of the uterus nearly straight, and converting the retroflexion into a retroversion. The first stage of replacement is then to carry the handle of the sound backward toward the perineum, thereby partially elevating the fundus. The operator should do this with great gentleness, remembering the powerful leverage he is exercising, and any excessive resistance, as from adhesions, will then be discovered at this stage, and the attempt abandoned. It is not very usual, however, for the fundus to be tethered by adhesions without the existence of some periuterine thickening which may be detected by a skilful observer. It is more common to find a fixation which is only apparent, and due to the swollen fundus having become gripped between the utero-sacral ligaments at either side. The second stage in reduction is to sweep round the handle of the sound through a rather wide semicircle, so that the handle and stem describe a semi-cone. and the intra-uterine portion rotates nearly on its own axis (*see* Fig. 23, p. 35). The third stage is to carry the handle again backward toward the perineum, and so bring the fundus completely forward. If the handle of the sound were simply rotated, its point would necessarily describe a circle, and press injuriously upon the fundus.

A uterine repositor has been invented, in which the handle is not rotated, but the direction of the intra-uterine portion is changed by means of a screw. The sound, however, if used in the way described, is more convenient and quite as safe. After withdrawal of the sound, the pessary may often be adjusted before the displacement has had time to recur. If, however, the fundus drops back at the moment of its withdrawal, one of two methods may be used. With great caution, either the pessary may be passed into position over the handle of the sound, or restoration with the sound may be effected while the pessary is in the vagina, the uterus, in both cases, being held in perfect position until the pessary is fully adjusted. If the first method is adopted, it is desirable to have an assistant, who holds the handle of the sound steady while the pessary is passed through the vulva, the left hand being employed at that moment in separating the labia and retracting the perineum.

In general, the patient herself cannot insert a Hodge's pessary. Some patients, however, may be taught to do so, if the vagina is not too contractile, and the pessary has only a slight or moderate curve. The woman simply takes the pessary by its lower end and pushes it up into the vagina, holding the lower end as much forward as possible against the pubes and anterior vaginal wall, so that the upper end may slip behind the cervix.

A Hodge's pessary, in one or other of its varieties, is found practically to be of far more value than all other pessaries put together. This is due to the fact that it alone can be perfectly adapted to the natural shape of the vagina, to which it forms a kind of splint, keeping it in its normal position, and steadying the uterus without pressing upon it.

There is another method of keeping a retroflexed uterus in place, which is mechanically the most perfect, although for other reasons undesirable, and which may be tried in some very exceptional cases if all other means fail. This is the use of an intra-uterine stem, in conjunction either with a simple Hodge's pessary or with some vaginal support, which must not be rigidly connected with the stem. If, however, a Hodge's pessary be chosen with a posterior limb long enough and curved enough, and if sufficient perseverance be shown in the use of the sound and postural treatment as adjuncts, a stem pessary will rarely, if ever, be required. The Hodge's pessary may fail, however, when the posterior cul-de-sac is too ill-developed, or too atrophied, to admit an instrument of sufficient length, or when the vaginal walls are so excessively relaxed as to take no grasp of even a large pessary; but in such a case, Cutter's retroflexion pessary, shortly to be described, may be tried, and is free from the danger which attends the use of an intra-uterine stem. Also, in the rare cases of congenital or primary retroflexion not dependent upon an antecedent retroversion, the mechanism of Hodge's pessary is less effective, since it can only act by direct pressure upon the fundus, and by this means can only partially elevate it. A simple straight stem of glass or vulcanite, ending in a knob, is the best to use in these cases, in combination with a Hodge's pessary, if any stem is used.

When there is difficulty in keeping the uterus in place, it is sometimes necessary to use at first a Hodge's pessary which is rather a tight fit for the vagina, but which after a while may be exchanged for a smaller one. In very obstinate cases of retroflexion, when there is great difficulty either in getting the fundus into position or in keeping it there, the following plan may succeed when other means fail. The uterine canal is fully dilated with laminaria tents, thus straightening the uterus for the time being; then an anæsthetic is given; the finger is then passed well up into the uterine cavity and used as a repositor, until the external hand can be got behind the fundus, to bring it forward into a position of anteversion. A full-sized pessary is then adjusted, while the external hand still holds the fundus in anteversion.

The action of a pessary should be observed every week or two for the first few weeks. Afterwards, patients should be enjoined to come for observation about every two months, and to use a vaginal injection twice a day.

The time during which it is necessary to continue wearing a pessary varies very widely in different cases. It is only in those cases in which the pessary completely restores the uterus, or converts the retroversion into an anteversion, that a cure may be looked for in the sense that the pessary may be left off without the displacement recurring. For this to take place the utero-sacral ligaments must have recovered their tone sufficiently to prevent descent, and the uterus have lost its tendency to bend into a posterior curve. The time required can hardly be less than a good many months, and may be years if the displacement was of long standing. A favourable time for such complete cure is that following parturition, when involution affects the uterine ligaments and vagina as well as the uterus, provided that care is taken to prevent recurrence of the displacement till the process is complete. When it is hoped that the cure is complete, the removal of the pessary should be regarded as an experiment. If the retroversion or retroflexion is reproduced, the pessary should be resumed before it has advanced to a high degree.

In cases in which, after prolonged trial, the pessaries used only partially restore the uterus, and keep up the fundus by direct pressure, it should be considered whether inflammatory complications are not keeping up congestion and increased weight, and preventing a more satisfactory result. If there are signs of endometritis, a curetting, followed by medicinal treatment to promote involution, often aids in the relief of the displacement.

In cases of retroversion or retroflexion in which the uterus is too tender to allow any pessary to be tolerated, it may be supported temporarily by tampons soaked in carbolized or iodized glycerine, as described at page 280. The best material for these is the mixture of absorbent cotton with purified sheep's wool,* if any prolonged use of the tampon is intended. The tampons should be changed every second day. In the case of retroflexion, however, this method rarely effects more than a very partial restoration.

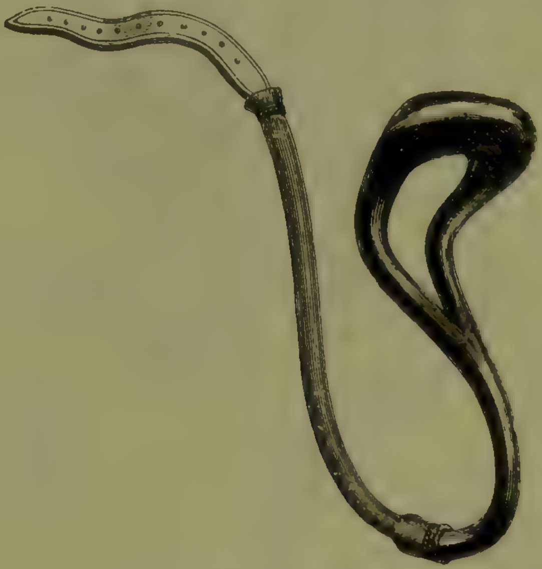

Fig. 151.
CUTTER'S Pessary for Retroflexion, modified by THOMAS.

The use of Hodge's pessary may be rendered impossible by the presence of one or both prolapsed and tender ovaries, pressure on which cannot be tolerated. It is then often necessary to commence with treatment directed to the ovaries, but it is very desirable in such cases to restore the uterus, since the ovaries are then elevated at the same time, and a form of pessary may sometimes be found by trial—especially a very thick pessary, or one with an expansion at the upper end like that of Thomas's pessary—which elevates the ovary, and does not press painfully. If this is not tolerated, an elastic ring pessary may be tried.

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* Johnson and Johnson's tamponite.

A useful form of pessary for cases when the vagina is too lax to keep a Hodge's pessary in place, or when it is desired

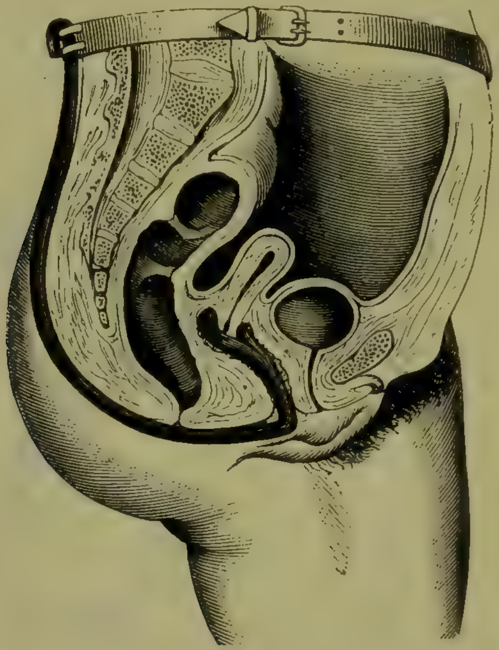

Fig. 152.
CUTTER'S Pessary in Position.

to effect a gradual stretching of a short posterior cul-de-sac, is Cutter's pessary for retroflexion (Fig. 152). From its having an external support, this pessary is more likely to communicate shocks to the fundus ; it has also the drawback that it must be introduced by the patient herself daily, and removed at night, and hence it is liable either to be pushed up in front of the cervix in introduction, unless some dexterity be used, or to slip into that position afterwards. To diminish the chance of this, the vaginal portion of the instrument should have but a slight curvature. The single band of the instrument is carried backward over the perineum and attached to a waist-belt, as shown in Fig. 152.

In this figure is shown Donaldson's modification of Cutter's pessary in position. The pessary is made of wire, covered by india-rubber. The india-rubber covering is continuous with the supporting band, so that there is no joint to chafe the perineum. The upper curve is very slight, so that the pessary may be less likely to run up in front of the cervix, and the shape of the stem corresponds with the natural curve of the vagina (*see* Fig. 2, p. 5). As the instrument is passed in, the lower end should be held well forward, to ensure that the upper end passes behind the cervix. If the single posterior band is not found to keep the instrument firmly in place, the lower end of the pessary may be adapted to two bands, one anterior and one posterior.

Operative Treatment.—In the great majority of cases of retroversion and retroflexion, treatment by pessaries is capable either of curing the patient or of securing a reasonable amount of comfort. Operative treatment may be called for in cases in which the uterus is tethered by adhesions in a position of retroversion or retroflexion, and also in rare cases in which no pessary can be found to relieve the displacement, or in which pessaries are not readily tolerated. In the case of fixation by adhesion, if the adhesions are recent, the uterus may sometimes be gradually restored and the adhesions stretched by occasional manipulations. especially by pressure on the fundus from the vagina or rectum in the knee-elbow position. Sometimes the adhesions are more rapidly stretched or broken down under an anæsthetic, but this should not be attempted if there is any suspicion of pus in the Fallopian tubes or near them, for fear of causing escape of pus into the peritoneum. The best method is to place the patient in the lithotomy position, rectum and bladder being emptied. Two fingers of the right hand are passed into the rectum, and the thumb into the vagina, while the left hand is placed upon the abdomen. The fingers gradually raise the fundus, while the thumb pushes the cervix backward. The externally-placed hand aids in pushing back the cervix, and finally gets behind the fundus, if it can be raised sufficiently, and draws it forward. This method can rarely separate adhesions so thoroughly as an abdominal section, and generally the result is only partial.

Antiseptic improvements in surgery have rendered justifiable even operations involving the opening of the peritoneal cavity for the cure of conditions not endangering life, in the hands of surgeons whose skill and antiseptic care render the risk of such an operation practically *nil*. Several operations have been performed for the cure of retroversion and retroflexion.

Alexander's Operation.—This consists in pulling out and shortening the round ligaments extra-peritoneally. Very special antiseptic precautions are necessary, as the operation has a particular liability to be followed by suppuration of the wound. This is accounted for by the low vitality of the structures concerned, tendon and fat; the damage to the nutrition of the tendon by its separation from surrounding parts, and consequent liability to inflammation ; and the amount of handling required.

The skin should be carefully scrubbed and disinfected, the pubes shaved beforehand on both sides, and a compress of perchloride of mercury, 1 in 1,000, kept on for twelve hours. It will lessen the risk of suppuration if the operator and his assistant wear india-rubber gloves. If this is not done, special care should be taken not to touch with the fingers that part of any suture or ligature which is left within the tissues, or even the knots.

As a first step, the uterus is put into position, and kept there by a Hodge's pessary, if this is practicable. If there are signs of endometritis a curetting may, with advantage, be performed at the same time. The spine of the pubes is felt, and an incision made from a point just internal to it, for about two inches in the direction of the inguinal canal parallel to Poupart's ligament. In fat patients a longer incision is required than in thin. The depth of the wound is increased until the aponeurosis of the external oblique muscle is exposed. The external abdominal ring is easily felt by the tip of the finger, the guide to it being the external pillar attached to the spine of the pubes. The pillars of the ring are laid bare, and the inter-columnar fascia at the external ring snipped with scissors. A small mass of fat now protrudes. On the surface of it runs a small nerve, the ilio-inguinal, and some reddish fibres are seen diverging to be attached to the pubes. These are the terminal fibres of the round ligament, which is very thin and weak at this point. An aneurism needle is passed under the whole mass close to the bone from without inward, and the whole carefully raised. The fibres of the cord are then separated from the connective tissue and from the nerve. The nerve should not be cut, but laid aside. Then the cord is seized between the finger and thumb, and slowly and carefully pulled out. No forceps should be used to seize it, for they are apt to tear the weak extremity, and then the cord becomes difficult to find. Before pulling on the cord, if it has not been possible to keep the uterus in position by a Hodge's pessary, the uterus should be restored by the sound, and the sound held in position by an assistant. The cord increases in size as it is pulled up, until it becomes a large white fibrous structure. As it comes out it is separated from its lateral attachments to the ring and canal, the pubic end being left attached. As great a length should be pulled out as will come without too much force. The length will vary according to the degree of displacement, especially the amount of prolapse, but generally as much as three inches should be drawn out.

The loop of cord is then allowed to drop, and the same proceeding carried out on the other side. This being done, the pubic end of one cord is divided, and the end of the cord held by an assistant sufficiently on a stretch to keep the fundus uteri well forward. A curved needle with a suture of fine fishing-gut is passed through one pillar of the ring, then through the round ligament and the opposite pillar. It is then passed back through the same structures in the reverse direction, bringing the two ends to the same side, and is thus tied as a buried mattress suture. This closes the canal as well as securing the cord in place. The ligament is then cut off half an inch beyond the ligature, and any bleeding vessel from the cut end secured. The superficial wound is closed by fishing-gut sutures. The same procedure is carried out on the other side, and the wounds covered with antiseptic dressings. Alexander advised the use of two interrupted buried sutures through the cord and the pillars of the ring, and the use of a small drainage-tube passed into the canal for about a quarter of an inch. A Hodge's pessary should be kept in place for two or three months after the operation till the union is firm, and the patient should be kept in bed for two or three weeks.

If the round ligament cannot be found at the external ring, the inguinal canal must be slit up with scissors, and the ligament sought for at a spot where it is stronger. Some operators do this in all cases, but it tends to increase the risk of subsequent hernia. If the canal is opened, from three to five sutures are advisable, each piercing the margins of the canal and the round ligament, the last uniting the pillars of the external ring with the ligament. Newman, of Chicago, opens the inguinal canal farther out, not interfering with the external ring. He then pulls out a loop of ligament on either side about four inches in length, stitches it together, and unites it to the aponeurosis and walls of the canal by buried animal sutures.

Disadvantages of Alexander's Operation.—Alexander's operation is not successful if the uterus is tethered backward by adhesions, unless the adhesions are first separated by opening the peritoneal cavity, for, even if the adhesions allow the fundus to be drawn forward, they gradually pull it back again, stretching out the round ligament afresh. It may be impossible to find any round ligament strong enough to draw forward the fundus, or the ligament may break on traction. In the case of a persistent canal of Nuck, extending to the pubes, the round ligament lies in the wall of the canal, and cannot be separated and drawn out. If the inguinal canal has been weakened, especially if there has been suppuration, an inguinal hernia may follow. The shortened round ligament may extend again, and the displacement recur. In some cases, suppuration of the ligament has extended to the peritoneum and led to a fatal result. The mortality of the operation is, however, very slight in the hands of those who have performed it frequently. Kellog, of Michigan, reported 400 cases up to 1895 without a death.

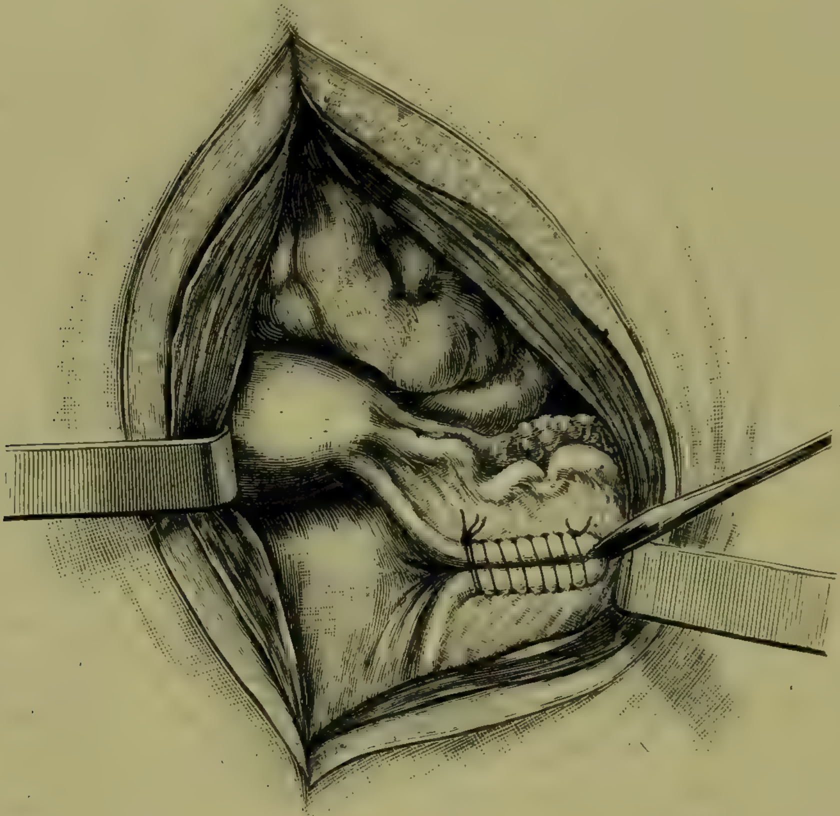

Fig. 153.
Intra-peritoneal Shortening of the Round Ligament.

Intra-peritoneal Shortening of the Round Ligaments.—This operation has the following advantages over Alexander's operation, and I have thought it generally preferable, unless the patient objects strongly to the median abdominal incision. It allows examination of the uterus for posterior adhesions, and separation of these. This is less risky than separating adhesions from the pouch of Douglas as a preliminary to Alexander's operation, for any bleeding which occurs can be better seen and dealt with, and the state of the uterine appendages examined. The operation is easier, and there is no risk of breakage of the round ligaments or failure to find them. The exact degree of shortening required to keep the fundus forward can be seen. While in Alexander's operation the peritoneum and cellular tissue covering the ligaments are thrown into folds, and tend to stretch out the ligaments again, in this operation the peritoneum adds to the strength of the shortened ligaments. There is no interference with the nutrition of the ligaments by their separation. The only objection to the operation is the opening of the peritoneal cavity; but the risk is probably no greater in the hands of a careful aseptic surgeon, and there is not the risk of suppuration which attends Alexander's operation.

The operation is performed as follows:—A median abdominal incision, about three inches long, is made, ending a little above the pubes. After separation of any posterior adhesions of the uterus, the uterine appendages are examined. The fundus uteri is then drawn forward by the fingers; the round ligament is taken up by the finger and thumb, and a pressure forceps seizes it at the centre of the part which it is intended to shorten, and draws it outward, the abdominal opening being drawn toward the same side by a retractor. A continuous suture of fine fishing-gut is then put in. This commences at the angle where the ligament is folded on itself, and is continued until the ligament is shortened enough to hold the fundus well forward, each loop piercing the centre of the ligament on both sides (Fig. 153). The same procedure is carried out on the other side, and the abdominal wound closed.

The method of folding the round ligament above described is the simplest and best, as it allows the shortening to be gradually carried out until the effect produced on the uterus is adequate. But some operators bend the round ligament twice upon itself, and so make a triple fold, or turn the angle inward and stitch it to the front of the fundus uteri, a procedure which has no advantage. Both this and Alexander's operation have the advantage that they interfere in no way with pregnancy or parturition, since there is nothing to prevent the round ligament growing and elongating in the usual way. Such physiological stretching may, however, do away with the effect of the shortening.

Some operators shorten the round ligaments from the vagina by performing an anterior colpotomy, separating the bladder from the uterus, and drawing down the fundus through the opening into the vagina. But, in this unnatural position of the fundus, the ligaments cannot be shortened so completely as they can by the abdominal operation.

Vaginal Fixation of Uterus.—In this operation the bladder is separated from the uterus, and the lower part of the anterior wall of the fundus stitched to the vagina, so as to convert the retroflexion into an anteflexion combined with anteversion. The cases suitable for it are those in which there is a retroflexion causing serious symptoms not amenable to treatment by pessaries, and in which there is no very serious degree of prolapse. The operation tends to prevent prolapse by keeping the uterus in a position of anteversion, in which prolapse is less easy; but it does not overcome a strong tendency to it. It is of benefit to a slight degree of cystocele, by tilting the cervix backward, and so stretching the anterior vaginal wall; and anterior colporrhaphy can be performed at the same time if desired.

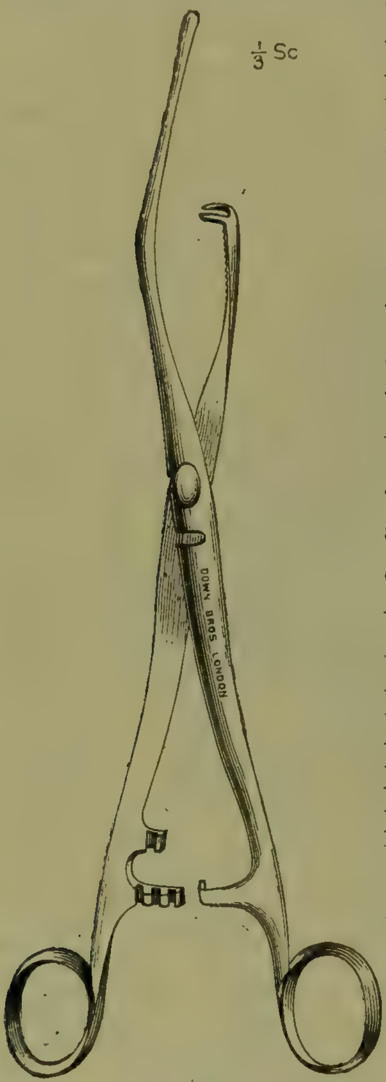

Fig 154.
Martin's Uterine Vulsellum.

The patient is placed in the lithotomy position, and secured by Clover's crutch (Fig. 65, p. 77) or leg rests. The vulva is shaved and disinfected, and the vagina also is disinfected. The most essential instrument for use in the operation is Martin's (or Orthmann's) vulsellum (Fig. 154), one blade of which forms a sound to turn the fundus in any direction, while the other holds the cervix firmly. With this the cervix is seized, and drawn strongly downward to the vulva. In this way the upper half of the vagina is inverted, and descends with the uterus. Lateral retractors may be used to separate the vulva. A central vertical incision is then made through the vaginal wall, from the point where the vagina joins the cervix, for about two inches towards the meatus urinarius, thus opening the vesico-vaginal cellular tissue. The vaginal wall is reflected somewhat to each side by the scalpel, and then the separation of the bladder from the uterus and vagina is carried out mainly by the fingers or blunt instruments, until the vesico-uterine fold of peritoneum is reached. As the bladder is separated it is held back by a short-bladed retractor, whose handle is held above the pubes. The fold of peritoneum is opened by scissors or scalpel, and the opening enlarged till two fingers can be passed in.

At this stage any posterior adhesions of the uterus can be separated by passing the fingers over the top of the broad ligaments. If it is desired to examine the uterine appendages, a small vulsellum is fixed on the anterior wall of the uterus as high up as possible, the Martin's vulsellum is removed, and the fundus is drawn down through the peritoneal opening into the vagina. The broad ligaments and ovaries can then be easily reached.

To suture the uterus the fundus is held well forward by the Martin's vulsellum, and the bladder held out of the way by a retractor. A suture of fishing-gut on a curved needle is passed first through one side of the vaginal wall, then through about half an inch of the centre of the anterior wall of the uterus, a little above the internal os, and finally in the reverse direction through the other side of the vaginal wall, the anterior layer of peritoneum not being included, but pushed away to the sides. Two more sutures are passed further forward in a similar way, the last being not higher than half-way up the anterior wall of the fundus. Thus, when the sutures are tied, the anterior wall of the uterus is united to the vagina by a sero-fibrous union, which is firm and not likely to stretch or get separated. The union of the vaginal incision is completed above and below by other fishing-gut sutures. The sutures are left from seven to ten days, and the patient is kept in bed at least a fortnight. A light plug of antiseptic gauze should be kept in the vagina. Moist iodoform gauze (10 per cent.) answers the purpose well. It should be changed at two or three days' intervals.

This operation has the advantage that it does not involve any external scar, and it is a very effectual cure for retroflexion.

It is the best of all, in cases suitable for it, when pregnancy is not likely to occur. Certain disadvantageous effects have been found in some cases in connection with pregnancy and parturition. If the fundus is prevented from rising, dragging pain may be produced, and abortion may be excited. In parturition, the displacement of the cervix backward has caused difficulty in the dilatation of the os; and even Cæsarian section has been found or considered necessary. In other cases, however, pregnancy and parturition have proceeded normally. Experience has not yet fully decided how far this objection to the operation is a valid one; but probably it may be avoided by not carrying the sutures too high up on the anterior uterine wall. The upper half of the anterior wall then grows sufficiently for the accommodation of the fœtus.

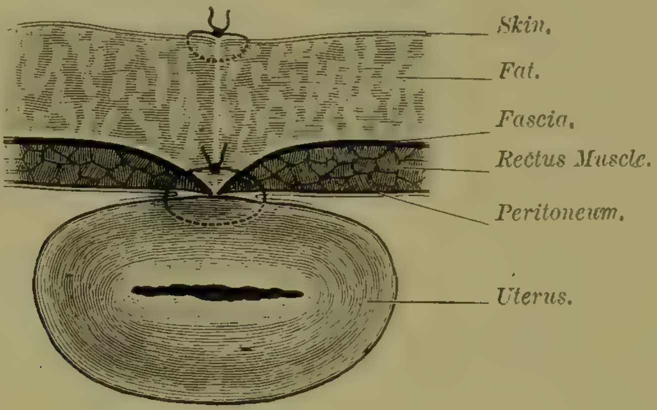

Fig. 155.
Application of Sutures in Abdominal Fixation of Uterus.

Abdominal Fixation of Uterus.—This operation consists in opening the abdomen in the middle line, and stitching the uterus to the abdominal wall. If peritoneum is merely united to peritoneum, the adhesion almost always lengthens out into a thin band, or may get separated altogether, and the effect of the operation is lost. To obtain firm and permanent union, a broad surface of the uterus must be stitched to fascia or muscle.

The operation is facilitated by using the Trendelenberg position, with the pelvis raised at a moderate angle. An incision about three inches long is made in the median line midway between umbilicus and pubes, and the peritoneum opened to the same extent. Any uterine adhesions are first separated, and the uterine appendages examined. The fundus uteri is then drawn forward by the fingers. The following steps depend upon whether or not any future pregnancy is possible or likely to occur. If not, the fundus uteri, or a surface a little below it on the anterior wall, may be fixed to the parietes. If pregnancy is expected, the sutures should be passed through the anterior wall about its centre, or towards its lower half, so as to leave the upper part of the fundus the capacity to expand upwards during pregnancy. Howard Kelly advises anteflexing the uterus, and passing the stitches through the posterior wall near the fundus.

The material for the sutures may be fine silkworm gut, chromic catgut, or sterilized silk (Chinese twist, No. 2). If silk is used, the part of the loops to be left should not be touched by the fingers. The mode in which I am accustomed to place the sutures is shown in Fig. 155. First, a loop is passed by a curved needle through the uterus only, at the highest spot in its wall which it is intended to suture, and is used temporarily for the purpose of holding up the fundus. Two sutures below it are then passed as follows:—The suture is passed by a curved needle first through a broad margin of the fascia superficial to the rectus, and just the edge of the rectus muscle may also be included. It next pierces the peritoneum twice, so as to invert its edge and bring the cellular tissue surface of the parietal peritoneum against the peritoneum of the uterus. Then it is passed through the uterine wall for about three-quarters of an inch, and on the other side is brought back in reverse order. First, it pierces the peritoneum twice, entering from its outer surface, then the edge of muscle and fascia. After these two sutures are applied, the first suture which had been holding up the fundus is passed through fascia, muscle, and peritoneum in a similar way. A needle mounted in a handle is passed from without inward, the end of the suture is threaded through it, and so withdrawn. The other end of the suture is similarly drawn through on the other side. The three sutures being thus tied up, a broad sero-fibrous union is effected over the centre of the uterus, while the reflected edges of peritoneum are secured at the sides. The remainder of the abdominal wound is closed in the usual way. The point at which the fundus is fixed should be about midway between pubes and umbilicus. Some operators do not use buried sutures, but carry the uterine sutures through the whole abdominal wall, and remove them after eight or ten days.

This operation is completely successful as a cure for retroflexion if pregnancy is impossible, or if the patient is sterilized at the operation by cutting a piece out of each Fallopian tube. If pregnancy occurs, unfortunate results may happen, such as pain from traction, abortion if the fundus is unable to rise, and difficulty in parturition from misdirection of the uterine action. If, however, the centre or lower part of the wall of the fundus only has been sutured, the results ought not to be worse than when a uterus has become adherent to the abdominal wall after Cæsarian section, in which case pregnancy generally goes on without difficulty.

As compared with vaginal fixation, abdominal fixation is better adapted to those cases in which there is considerable tendency to prolapse. It is also a valuable operation for prolapse, as will hereafter be seen; but, in severe forms of it, it is not always by itself a certain and permanent cure.

Ferguson* has modified the operation of abdominal fixation in the following way. He makes a median incision through skin and fat. Then an incision is made on either side through the anterior sheath of the rectus. The rectus is retracted outward, and an incision made directly behind it through the transversalis fascia and peritoneum. The round ligament is seized by forceps, tied, and divided. The distal end is dropped; the proximal end, with adjacent portion of broad ligament, is pulled up into the wound, and stitched to the peritoneum and transversalis fascia. The rectus is replaced, and the opening in its anterior sheath is closed with a continuous suture, which includes the round ligament. The same procedure is carried out on the other side, and the external incision closed.

By this operation the uterus is not fixed to the abdominal wall, but is suspended free, and is capable of movement. It is therefore less likely to interfere with the course of pregnancy. There would seem, however, to be a greater risk that a coil of intestine might be strangulated through the loop formed between the round ligaments.

Comparing the various operations together, it will be seen that, if future pregnancies are unlikely, or if the case is considered to justify sterilization of the patient, intra-peritoneal shortening of the round ligaments affords a reasonable certainty of cure with the least disturbance of normal relations. Alexander's operation involves an equally small disturbance of normal relations; but the result is less certain, and is apt to be upset by pregnancy. Abdominal fixation gives a somewhat greater certainty that the fundus will remain fixed forward. Vaginal fixation avoids the external scar, and possible risk of ventral hernia; but is not nearly so easy an operation to perform, except to those practised in vaginal surgery. Sterilization of the patient may, if desired, be combined with either of the last two. Experience has shown that it is not sufficient, for this purpose, to place a ligature upon the tubes. The best plan is to place two ligatures of fine silk upon each tube, and snip out a piece of the tube between them. Finally, the mucous lining of the tube is drawn up with forceps out of each stump, or, at any rate, that next the uterus, and cut off as deeply as possible. The orifices are then certain to be occluded in the healing process.

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* "Journ. Amer. Med. Assoc.," Nov. 18, 1899.

PROLAPSE OF THE UTERUS AND VAGINA.

Pathological Anatomy.—The plane of cellular tissue and fascia, in the middle of which the centre of the uterus is balanced, forms a floor to the pelvis, or rather to the whole abdominal cavity, and is one of the boundaries which retain the abdominal contents. All descent of the uterus or vagina implies a yielding of this pelvic floor. All forms of prolapse, therefore, may be regarded as analogous to hernia; and in all of them there is a protrusion below their normal level, and sometimes externally, of peritoneum and of small intestines. The mildest degree of prolapse is prolapse of the pelvic floor without relative displacement of the uterus. This usually depends upon general laxity and weakening of tissues from malnutrition. Normally, some descent of this

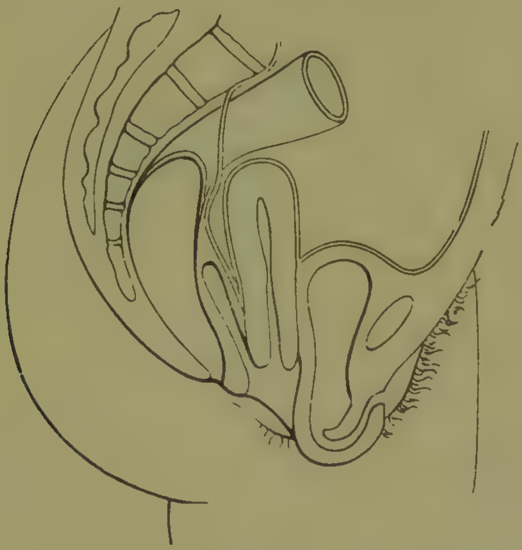

Fig. 156.—Prolapse of the First Degree.

kind takes place in any bearing-down effort. The perineum and anus bulge not more than from half an inch to an inch below their normal level, the uterus becomes a little more retroverted, and the vagina shortened. In prolapse of the pelvic floor this condition exists even in a position of rest, and is exaggerated by any effort, so that the protrusion may be as much as from two to three inches.

From the close connection of the uterus with the bladder and anterior vaginal wall, these structures necessarily take part in all downward displacements of the uterus, and it will therefore be convenient to consider prolapse of the vagina in association with prolapse of the uterus. Descent of the uterus has commonly been termed prolapsus so long as the cervix remains within the vulva, and procidentia when it passes outside, although, from the derivation of the words, an opposite usage would have been more appropriate. A better classification is that into three stages of prolapsus —the first stage, in which the uterus remains entirely within the vulva (Fig. 156, p. 299); the second, in which it passes partially outside (Fig. 157); and the third, in which the whole uterus is extruded beyond the vulva (Fig. 158), As the uterus descends, the cervix tends to move in the direction of the vagina as being that of least resistance, and thus the axis of the uterus follows the curved axis of the pelvis, and becomes more and more retroverted in proportion as it becomes lower (Fig. 157). The two chief causes of retroflexion then come into play (*see* p. 270), so that this displacement is commonly added to the retroversion, and the

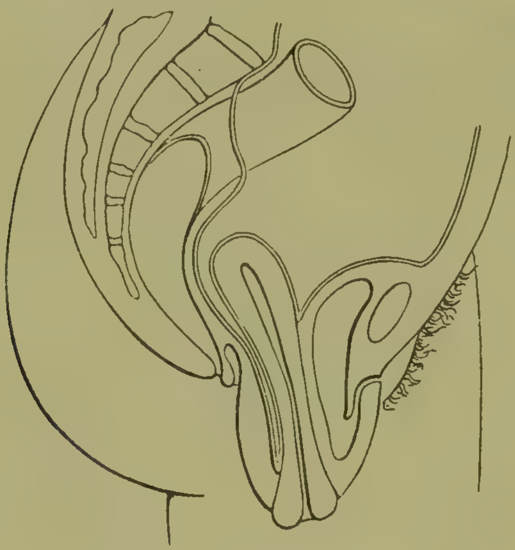

Fig. 157.
Prolapse of the Second Degree (or Procidentia).

fundus lies low in the hollow of the sacrum (Fig. 157). When the uterus is finally extruded, it is always in a position of combined retroversion and retroflexion (Fig. 158), unless it has been previously fixed in a position of anteflexion by the presence of a fibroid tumour or other such cause. An important distinction must be made between simple prolapse of the uterus and prolapse associated with elongation of the supra-vaginal cervix, a much commoner condition.

The usual course of events is that the anterior vaginal wall descends first, is followed by the uterus, and the uterus then draws down and inverts the posterior vaginal wall from above (Fig. 157). Not infrequently, if the perineum is destroyed or deficient, there is also some bulging and inversion of the posterior vaginal wall from below, at the same time that the anterior vaginal wall is descending. It is rare for the uterus to descend first and invert both vaginal walls from above. When it occurs, it implies that the cause of descent affects the uterus first, and not the vagina. One or both vaginal walls may be prolapsed without any descent of the uterus. It is rare for prolapse of the anterior vaginal wall to proceed very far without some descent of the cervix. Prolapse of the posterior vaginal wall, beginning from below, after destruction of the perineum, may proceed much farther before it affects the cervix, because it has first to obliterate the posterior fornix of the vagina. On account of the close connection between the urethra and base of the bladder and the

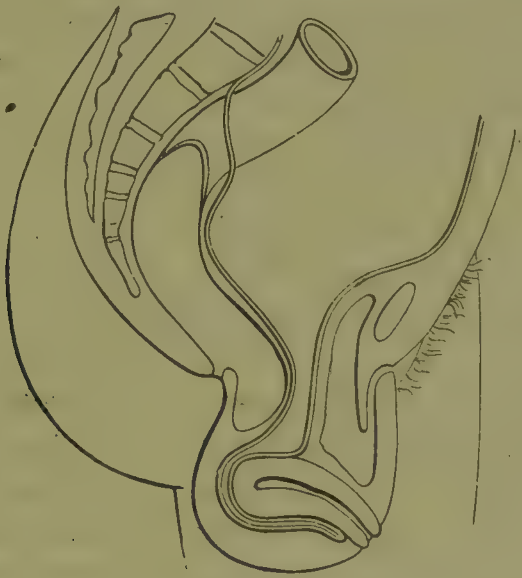

Fig. 158.
Prolapse of the Third Degree (also called Procidentia).

anterior vaginal wall, the bladder always descends with the anterior vaginal wall, constituting *cystocele.* There is more loose cellular tissue between the posterior vaginal wall and the rectum. Hence, in primary descent of the posterior vaginal wall, the rectum may, or may not, descend with it, constituting a *rectocele.* More often it does not; and the rectum rarely so completely fills the posterior procident pouch as the bladder does the anterior (*see* Fig. 158). If the posterior vaginal wall is drawn down by the uterus, and not prolapsed primarily, there is generally, in the second stage of uterine prolapse, a part of the posterior vaginal wall above the perineum not inverted, while the anterior vaginal wall is inverted completely as soon as the cervix protrudes externally (*see* Fig. 157). Even the posterior wall may eventually be completely inverted, as shown in Fig. 158.

Causation.—Predisposing causes are general laxity of tissue, especially of muscles, due to imperfect nutrition, and loss of fat as well as of muscular tone, such as occurs in old age. Previous parturition is an important antecedent, and prolapse is rare in the nulliparous. It produces its effects by relaxation of the vagina as well as of the ligaments of the uterus. One of the most potent causes is too early getting up after delivery, and especially exertion at that time, while the uterus is heavy from imperfect involution, and the utero-sacral ligaments have not recovered their tone. A more permanent effect, tending to prolapse, is rupture of the perineal body. When this extends back to the sphincter ani, and still more if it involves the sphincter, the anterior part of the loop formed by the levator ani around the vagina is divided. Nearly half of the anterior vaginal wall loses the support normally given to it by the posterior wall, and has to bear the intra-abdominal pressure unsupported. Hence arises descent of the anterior vaginal wall with cystocele. With or without rupture of the perineum, it is believed that the fibres of the levator ani surrounding the vagina at a higher level may be torn through in labour without laceration of the mucous membrane over them. Gaps are sometimes felt in the muscle immediately after labour; and at any rate it is common, in cases of prolapse, for none of the muscle to be discoverable in the central part of the vagina. So long as the loop of the levator ani retains its normal tonicity, holding forward the posterior vaginal wall in the direction of the pubes, it is impossible for the cervix to descend far. Its absence permits of descent, but if the utero-sacral ligaments remain firm, and there is no excessive abdominal tension, deficiency of perineum and laxity of vagina may exist for a long time without descent of the uterus.

The direct cause of prolapse is generally some excess of abdominal pressure, such as is produced by cough. Straining at stool in chronic constipation, or lifting weights, wearing of corsets and tight lacing, have an influence, but are not sufficient to produce prolapse in the nulliparous. Laborious occupations are a potent cause, and, combined with general laxity of tissues, may cause the most extreme forms of prolapse, even in virgins. That of a laundress is the most notable; but nursemaids sometimes suffer from prolapse, even though virgins, through lifting and carrying heavy children. Another cause contributing to the weakening of the anterior vaginal wall is habitual or occasional over-distension of the bladder.

In *simple prolapse of the uterus*, the uterus itself may be affected from the first by the causes of prolapse, and descend with the anterior vaginal wall; or the anterior vaginal wall with the base of the bladder may descend first, and subsequently draw down the uterus.

The former is seen in nulliparous women when the prolapse is due to hyperplasia of the whole uterus or of the vaginal cervix, to the presence of a fibroid tumour, or simply to laborious occupation or muscular strain. The latter is more common in parous women where there is deficiency of perineum, or relaxation of vagina.

Descent of the fundus below its normal level necessarily implies relaxation and lengthening of the utero-sacral ligaments. If the uterus is prolapsed simply, without elongation, it may be inferred that either the uterus was primarily affected, or that, if it was drawn down by the vagina, the utero-sacral ligaments offered a very slight resistance to the descent. If this lack of resistance continues, the prolapse may go on quickly to the third stage, in which the whole uterus is external to the vulva, without the uterus ever becoming lengthened. More often there is an intermediate stage of procidentia, or prolapse of the second stage, in which the uterus becomes lengthened.

Prolapse associated with Elongation of the Supra-vaginal Cervix.—In the great majority of cases in which the cervix appears externally, the uterine cavity is found to be much elongated. An old doctrine was revived by Huguier, who separated this condition entirely from prolapse, and considered that the fundus usually remained at its normal level, the cervical hypertrophy being primary. Out of sixty reported cases of prolapse, in which the cervix was protruded externally, he found only two cases of true prolapse. Some authorities still, following Huguier, consider that hypertrophy of the supra-vaginal cervix is a condition distinct from true prolapse, and not merely a consequence of it. On measurement with the sound, however, it will be found that the elongated uterine cavity is frequently about 4½ inches long, and rarely exceeds 5 inches, while the procident mass may protrude from 1 to 3 or more inches outside the vulva. A line drawn along the pelvic curve from the normal position of the fundus to a point 2 inches outside the vulva measures more than 6½ inches, and it is therefore clear, from measurement, that the fundus is almost always in these cases depressed more or less below its normal level. In the majority of cases also the sound will show the fundus to be more or less retroflexed, lying in the hollow ot the sacrum (Fig. 157, p. 300). Moreover, the elongated cervix is invariably increased in length out of proportion to its breadth. and often it is actually attenuated, and has become elastic instead of being a firm muscular structure. This is a proof that the change is, in the main, the result of tension, although the hyperplasia may have been due in part to a state of hyperæmia, or subacute inflammation, with subinvolution, taking its departure from labour.

There are two ways in which tension, tending to elongate the cervix, may arise. The first is due to primary prolapse of the anterior vaginal wall with the base of the bladder, which drags the uterus downward at the point of vaginal attachment, while the uterine ligaments, attached near the centre of the organ, tend to keep it in place. In most cases, the yielding takes place partly in the ligaments, leading to prolapse, and partly by stretching of the intervening portion of cervix. The next mode is one which is not noticed in text-books, but is capable of evoking a much greater force. It arises when the cervix, already partially prolapsed, is extruded through the vulva by any sudden effort, and is there gripped and partially strangulated, and its return prevented for a greater or less time. For it is a common experience that, notwithstanding the relaxation of the vulval outlet in these cases, some force is required to reduce the swollen cervix and prolapsed portion of vagina through this outlet. The elastic attachments. stretched for the moment, thus tend to restore the uterus and exert a tensile force on the cervix which may approximate in magnitude to the primary expulsive force of which it is the recoil, and is likely to be much greater than the mere weight of the anterior vaginal wall with the base of the bladder. This view of causation agrees with the fact that the great elongation with attenuation of the cervix is only met with in those cases in which the os uteri is generally or frequently external to the body; and that, if a case of prolapse afterwards reaches the third stage (Fig. 158, p. 301), and the uterus remains entirely external, it may again be reduced in length, and its measurement be as low as, or even lower than, normal. Some reduction of length may even take place immediately upon the uterus being restored, from the shrinking of the elastic cervix. This abnormal elasticity is due to the muscular fibres having become atrophied in conjunction with hyperplasia of the other elements of the tissue.

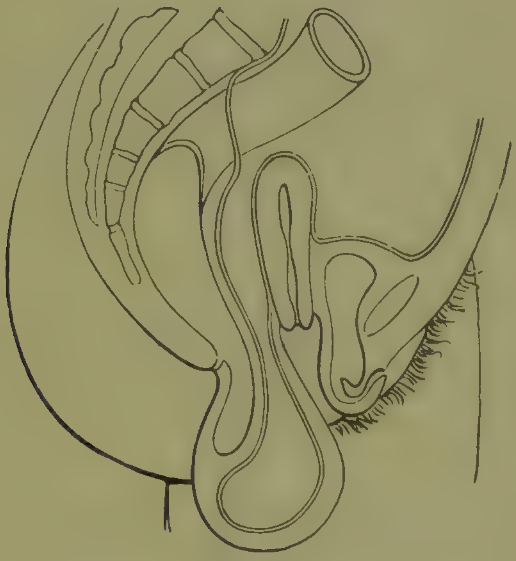

Fig. 159.
Prolapse of the Posterior Vaginal Wall with Rectocele and Enterocele.

In some specimens the lengthening has been found to affect not only the supra-vaginal but the intermediate portion of the cervix, sometimes the posterior vaginal reflection being the highest, as is normal, sometimes the anterior. This may be due to the elongation having been due to traction of the anterior vaginal wall, in the ordinary case, or of the posterior vaginal wall when that is first prolapsed, as in the case shown in Fig. 159. In some instances there may have been a congenital abnormality in the insertion of the vaginal reflections into the cervix.

Primary prolapse of the *posterior* vaginal wall rarely exists, except as the sequel of destruction of the perineal body. It may occur to a considerable degree without affecting the position of the uterus. The swelling so formed may, or may not, carry down with it a pouch of the rectum, forming a rectocele. If the whole posterior vaginal cul-de-sac is carried down, the pouch of Douglas generally descends with it, and in rare cases the small intestines descend into the procident mass, and form a large bulging tumour, much exceeding the size to which a rectocele usually attains (Fig. 159).

Results and Symptoms.—The chief symptoms of prolapse of the first degree are dragging pain in the back, hypogastrium, and groins, from the strain upon the uterine ligaments. Similar symptoms, in a slighter degree, attend prolapse of the pelvic floor without relative displacement of the uterus. The symptoms in general, and especially reflex neuroses, are often greater in proportion in the earlier stages of prolapse; for these more often occur in the active period of sexual life, when there may be neurasthenia from rapid child-bearing or other causes, and when the symptoms are often partly due to endometritis or congestion causing hyperplasia, or to subinvolution of the uterus. After the menopause, there is often a much greater toleration of considerable degrees of prolapse, and this is a main reason why many women neglect the condition, until it becomes very aggravated and difficult to cure.

The anterior vaginal wall, with the base of the bladder, almost always descends first, even when excessive weight of the uterus is the primary cause of displacement. As this begins to form a swelling, bulging externally (Fig. 156, p. 299), it is often mistaken by the patient for the womb itself. Though the bladder is often tolerant of this displacement, some difficulty of micturition is usually produced, and sometimes tenesmus and even cystitis, from decomposition of the urine retained in the pouch. This effect is greatly increased if the procident mass is allowed to remain down by night and day. Inflammation has sometimes spread to the kidneys and caused a fatal result. I have known the bladder to become filled with calculi, like a bag full of stones; the calculi not escaping when small, as they usually do, owing to the inverted position of the bladder. The presence of the uterus low down in the vagina causes a sensation as of a foreign body, and tends to excite expulsive efforts, which accelerate the progress of the prolapse towards the second stage.

When the procident cervix remains extruded through the vulva, it becomes swollen from the interference with venous circulation; leucorrhœa, and sometimes also menorrhagia or metrorrhagia, are excited. Often, ulcers are formed from the effects of exposure or friction on the cervix or vaginal walls, and these may be the source of frequent slight hæmorrhage and of purulent discharge. They are more often on the vagina, at a little distance from the os, than on the cervix itself. They do not readily heal while the ulcerated surface remains external, in consequence of the venous congestion impairing nutrition. But they do not become cancerous, and carcinoma of the cervix in association with prolapse is rare. In old-standing cases the rugæ of the vagina are lost, and the mucous membrane becomes hardened, like skin. From the effects of œdema and tension the mucous membrane also loses its close attachment to the cervix, the vaginal reflection becomes more indefinite, and the vaginal cervix may, in consequence, appear to have disappeared. In the third stage of prolapse, one or both ovaries may descend externally with the uterus. When in this position, the uterus is commonly found rather small, and the os contracted. The pouch of Douglas often descends externally even in prolapse of the second degree, but rarely contains any intestines (Fig. 157, p. 300; Fig. 158, p. 301). In recent prolapse there is ectropion of the cervix from tension of the inverted vaginal walls, but in old cases the os may be found small, and sometimes minute, even in prolapse of only the second degree. After the menopause the cervical canal may become more or less completely occluded from adhesive inflammation of the lining membrane. Displacement of the base of the bladder may, in rare cases, produce such obstruction to the ureters as to cause hydronephrosis or other kidney lesion, and unreduced procidentia may lead to extensive and even fatal sloughing.

Diagnosis.—In prolapse of the pelvic floor, without relative displacement of the uterus, the diagnosis must be made by noticing the amount of protrusion, and the increase in it resulting from a bearing-down effort. The latter may be estimated by a tape measure. The increase in the measurement from the tip of the coccyx over the soft parts to the apex of the pubic arch should not normally be much more than an inch.

Prolapse of the uterus of the first degree is often obliterated by the reclining position. If the symptoms lead to the suspicion of a partial prolapse, or if a bearing-down effort produces a greater than normal descent, an examination should be mad while the patient is standing, and the effect of a bearing-down effort tested in that position also. The extent of displacement can then be accurately estimated. Prolapse of the second degree may also be converted into one of the first degree by the recumbent position, but is generally reproduced if the patient bears down, especially if she stands up to do so.

Some other conditions may simulate cystocele or rectocele. These are cysts of the vagina, cystic diverticula of the urethra, fibroid tumours of the vagina (a very rare condition), an imperforate half of a double vagina distended by menstrual fluid, blood, or pus, and other distended congenital cavities, such as one derived from the duct of Gärtner. The diagnosis is made by restoring any prolapse which may co-exist, and finding that the swelling still remains in the vaginal wall. If on the anterior wall, it should be explored between the finger and a sound in the bladder; if on the posterior wall, between one finger in the vagina and a second in the rectum.

If the cervix uteri protrudes externally, or approximates to the vulva, it is distinguished from any other structure, such as an inverted uterus, or a polypus, or any other tumour growing from the uterus or vagina, by the presence of the external os. All that is required further is to distinguish between prolapse and elongation of the vaginal cervix. In the latter case the vaginal fornices are not depressed at all, if the fundus is at its normal level. If, as is usually the case, there is some secondary prolapse associated with it, the fornices are depressed in some degree, but not in proportion to the displacement downward of the cervix. If the cervix is pushed up as far as it will go, the fornices will be at their normal level, or even higher, while the cervix will project downward and occupy the vagina (*see* Fig. 99, p. 150). Both in simple prolapse and prolapse with elongation of the vaginal cervix, both fornices are depressed. If there is elongation of the intermediate portion of the cervix, one fornix is depressed more than the other. The use of the sound is generally desirable, to ascertain the length and direction of the uterine cavity, and to learn how far the fundus is below its normal level. The fundus may also be explored by the finger in the rectum.

Treatment.—The view here adopted as to the essentially secondary character, in the majority of cases, of cervical elongation associated with prolapse, has an important bearing on treatment. Huguier and others, accepting the logical result of their theory, have considered the only curative treatment to be excision, not only of the vaginal, but of a portion of the supravaginal cervix. If, however, the elongation be, in the main, secondary, it may be expected that, if means be found to maintain the cervix for a sufficiently long period at its normal level, and if, at the same time, any chronic inflammation present be suitably treated, the elongation will, in the end, diminish or disappear. The necessity for amputation is then limited, as a rule, to cases in which, not the supra-vaginal, but the vaginal portion of the cervix is elongated or enlarged. The treatment of these was considered under the head of Hyperplasia of the Cervix (p. 157)

Replacement of the Procident Mass.—After evacuation, if necessary, of the bladder and rectum, the patient should be placed in the semi-prone position, the procident mass well lubricated, and compressed steadily by both hands, so as to diminish its bulk. It may then be pressed gently upwards in the direction of the pelvic outlet, in such a way that the portion last prolapsed is returned first. The reduction is usually effected easily, but in some cases the bulk of the protruding mass may be so increased by œdema, that its return becomes very difficult. The patient should then be kept in bed for a time, in the first instance, while the swelling is supported, and treated by the application of cold by means of cooling lotions or ice, or gradual pressure by strapping or elastic bandages. In very rare cases, in consequence of inflammatory adhesions in the pelvis, especially when these are associated with some tumour connected with the uterus, the procidentia may be irreducible, and it is therefore essential to use no excessive force in attempting its restoration. For an irreducible procidentia, the only available treatment is a suspensory bandage, which may support and, by gradual pressure, eventually diminish the displaced mass.

Methods of Retaining the Uterus.—The indications for effecting a radical cure are: (1) to diminish the size of the uterus, if excessive; (2) to take away all sources of excessive downward pressure or traction; and (3) to restore the uterine supports to their normal condition. In general, however, these indications can only be fulfilled by protracted treatment which cannot be replaced even by operation, since the most important of the uterine supports, the utero-sacral ligaments, cannot be effectively dealt with by operation. In a large proportion of cases, therefore, it is desirable to use palliative means, and support the uterus by a pessary, which should be so chosen as to help and not hinder the means which may be used for radical improvement.

Prolonged rest in bed is, in all cases, of the greatest use in diminishing the size of the uterus, if that organ can be kept in place meanwhile, and this treatment should always be adopted in severe cases, if it is possible for the patient to carry it out, especially when any ulceration exists. The ulcers will then usually heal readily, but the healing process may be accelerated, if necessary, by passing lightly the solid nitrate of silver over the surface, or applying a solution of the same salt (gr. x.—xxx. ad ℥j.). If relaxation of the vagina be only moderate, and the stage of prolapse early, the use of astringents may suffice to effect a cure. Alum, tannin, iron alum, or sulphate of zinc may be used in the form of vaginal injections (ʒj.—ij. ad Oj.), but a more effective plan is to insert into the vagina daily one or two teaspoonfuls of either of these substances in powder, in a muslin bag, or wrapped in cotton-wool, while copious cold water injections are used from time to time. Benefit is also derived from the constitutional effect of cold hip-baths or sea-bathing, as well as tonic medicines, especially iron and strychnia. The administration of ergot may also give tone to the muscular walls of the vagina, as well as diminish hyperæmia of the uterus. Cough or chronic constipation is to be treated by suitable remedies. As a preliminary measure, to bring the uterus and vagina into a suitable condition for a pessary, and to allow ulcerations to heal, it is often useful to keep up the uterus by a large vaginal tampon, retained in place, if necessary, by a perineal band. This plan is especially indicated if the uterus will not remain in place even while the patient rests in bed, but it may sometimes obviate the necessity for confinement in bed. The congestive hypertrophy of the cervix may also derive benefit from the pressure exercised by the tampon. The best material for the plug is tamponite, a mixture of absorbent cotton with purified sheep's wool. If soaked in carbolized glycerine, to which alum or tannin may be added, such a tampon may be left in place two or three days. A useful combination of an astringent with an antiseptic, for soaking the tampons, may also be made by dissolving forty grains of alum and ten grains of boric acid in an ounce of glycerine.

Pessaries.—The pessary which of all others has the fewest drawbacks, and which will generally prove effectual in an early stage of prolapse, if the perineal body has not been much damaged, is a Hodge's pessary of the ordinary sigmoid shape (Figs. 143, 144, pp. 275, 276). The action of this instrument is to stretch the posterior cul-de-sac backwards and upwards, and so hold the cervix at its normal level, and keep the uterus in a position somewhat of anteversion, while it forms also a kind of splint for the vagina, and prevents the descent or inversion of any portion of it. If the lower limb be somewhat square (Fig. 143, p. 275), and have but a slight pubic curve, so that it rests behind and above the pubic arch, it will also support the base of the bladder, and so prevent what is often the first step in displacement (Fig. 156, p. 299). It is generally necessary that the instrument should be rather broad, but it should not be larger than is necessary to secure its retention. Gervis's pessary (Fig. 147, p. 278) is sometimes retained better, on account of the upward curve at its lower end.

When the perineal body is very deficient, the vagina lax, and the weight to be supported is considerable, a pessary of either form will usually be forced out. Another pessary, somewhat similar in its action, namely, the elastic ring pessary (Fig. 160), may, however, be retained. The best form of this is that made of steel spring covered with india-rubber. Owing to its elasticity, a ring of considerable size can easily be introduced by compressing it laterally. These rings are made in sizes enlarging progressively by $\frac{1}{8}$-inch. The larger sizes, from $2\frac{7}{8}$ to $3\frac{1}{4}$ inches in diameter, will be found most useful. The spring commonly used is often not stiff enough for the larger-sized rings; and the consequence is that the ring is compressed and forced out. In such a case, a pessary with stiffer spring may be retained. The diameter of the spring, with its rubber covering, should be at least $\frac{1}{2}$-inch, that its pressure may be readily tolerated. This pessary has the advantage that intelligent patients may be taught to introduce and remove it themselves, since, from its flatness, it naturally passes in the right direction, namely, behind the cervix, while a Hodge's pessary usually passes in front of the cervix, if introduced by an unskilled hand. If it is frequently removed, the

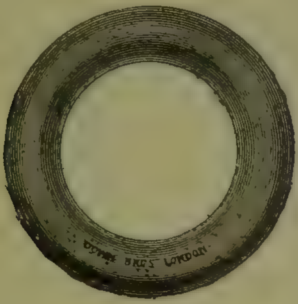

Fig. 160.
Watch Spring Ring
Pessary.

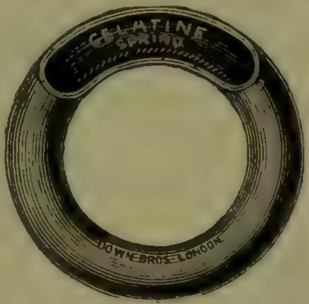

Fig. 161.
Padded Ring
Pessary.

disadvantages it has in consequence of the more absorbent character, and therefore inferior cleanliness, of its material are in great measure obviated. If it is worn continuously, antiseptic vaginal injections should be used daily. Sanitas fluid (ʒij. ad Oj.) answers the purpose well, but Condy's fluid should be avoided, on account of the deposit it produces on the pessaries, through its decomposition by organic matter. The pessary is not very long-lived, and should be replaced by a new one as soon as the surface of the rubber becomes wrinkled or rough. With these, and other pessaries covered with india-rubber, soap should be used as a lubricant rather than oil, which injures the rubber.

A variety of this pessary is made (Fig. 161, p. 311) in which the metal spring is thinner, and the pessary is filled with glycerine or gelatine. The pressure of this is still more easily tolerated.

A still better pessary, if it can be retained, is a ring of solid vulcanite, not too thin. On account of its greater cleanliness, it is especially suitable for patients who are unable or unwilling to remove the pessary frequently and cleanse it themselves. It has also the advantage that, since so large a size cannot be introduced, it does not keep the vagina so much stretched. To prevent its slipping out, it is necessary to select very precisely the largest size which can be passed through the vulva without too much force.

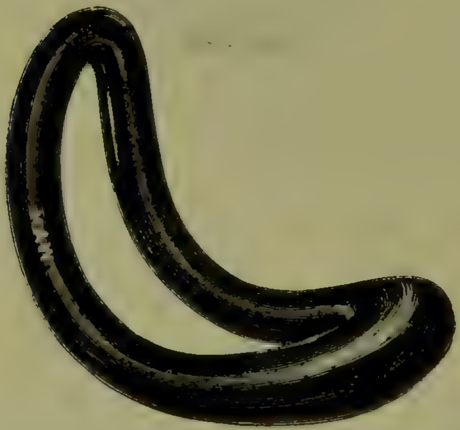

Fig. 162.—The AUTHOR'S Pessary for Prolapse.

As an alternative to the ring pessary may be used a form of pessary which will be frequently retained, when the sigmoid Hodge's pessary would fall out. This is one in which the anterior limb is bent upward, so that, viewed laterally, the instrument forms nearly an arc of a circle, about 110° in length (Fig. 162). The essential point in the mechanism of this instrument is that its anterior limb rests high up above the pubic arch, distending the anterior vaginal wall, with the base of the bladder, into a pouch, and does not press against the rami of the pubes at all (Fig. 163). Its escape is thus prevented by the posterior surface of the pubes and the posterior vaginal wall, without any assistance from the vulval outlet or perineal body. I have had the anterior limb of the instrument made in the form of a cylinder $\frac{5}{8}$-in. in diameter, so that its pressure may be as widely diffused as possible (Fig. 162). If, however, the posterior cul-de-sac is not capacious enough, the pressure of the pessary may not be tolerated; and if the vagina is so dilated that its width is nearly equal to its length, it is liable to turn round sideways. Again, the instrument fails if the vaginal cervix is so atrophied that it does not retain the posterior limb of the pessary behind it in the posterior vaginal cul-de-sac. Under such circumstances the elastic ring is preferable; otherwise the lever pessary has the advantages that its material is more cleanly, that it does not stretch the vagina so much laterally, and that it tends to push the fundus directly upwards if retroflexed, while the ring merely draws the cervix backward. It is therefore specially indicated when any considerable retroflexion exists. The mode of introduction of the instrument is the same as that of the sigmoid pessary (*see* p. 279), but its shape renders it rather more difficult to hook the posterior limb backward over the cervix into the posterior cul-de-sac. In proportion to this difficulty is the security of its retention, but even this pessary may fall out if the posterior vaginal wall has not sufficient tonicity to keep the anterior end pressed up behind the pubes. With this, as with every other pessary, it

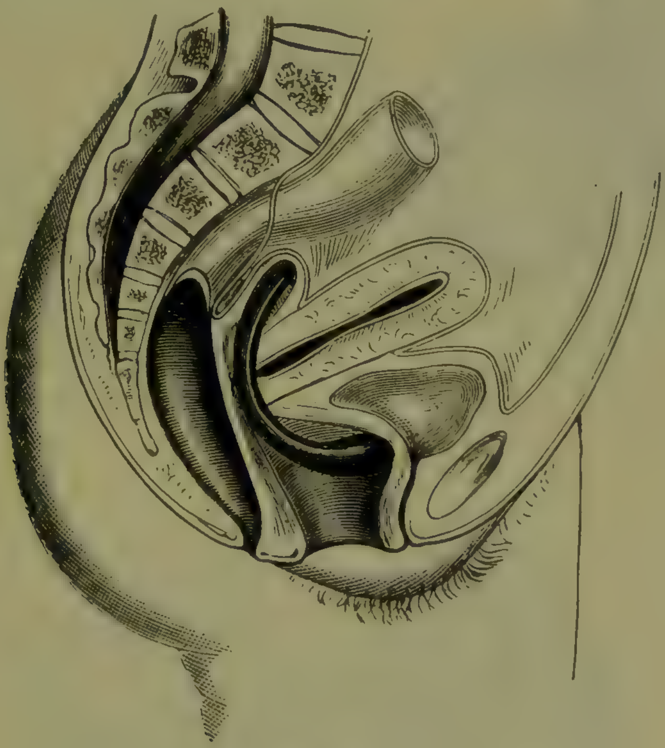

Fig. 163.
The Author's Pessary for Prolapse, in Position.

is essential that it should be removed at regular intervals, in order that it may be cleaned and the state of parts observed.

If the uterus be replaced, and the cervix maintained at its normal level by any of these pessaries, it is obvious that, if the organ be elongated, it must, for the time at least, either be more or less doubled upon itself, or the fundus must be elevated above its normal height. What most frequently occurs is a combination of the two effects. The uterus most readily tends to become doubled upon itself in a position of retroflexion, and it is often necessary to correct this tendency by replacement with the sound, so as to bring the axis into a position rather of anteflexion.

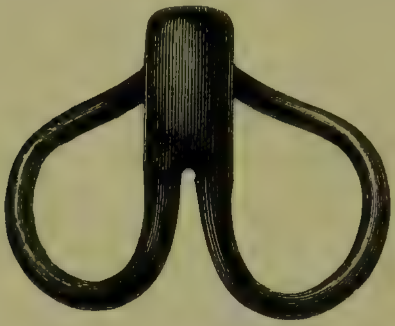

Fig. 164.
Cradle Pessary.

In prolapse of the anterior vaginal wall with cystocele, without descent of the uterus, the best pessary is some form of Hodge's or ring pessary which is large enough to stretch the posterior vaginal fornix somewhat upward. The anterior vaginal wall is then kept on the stretch by the posterior end, while the anterior end directly supports it. The last indication is best fulfilled by a pessary curved upward at the lower end.

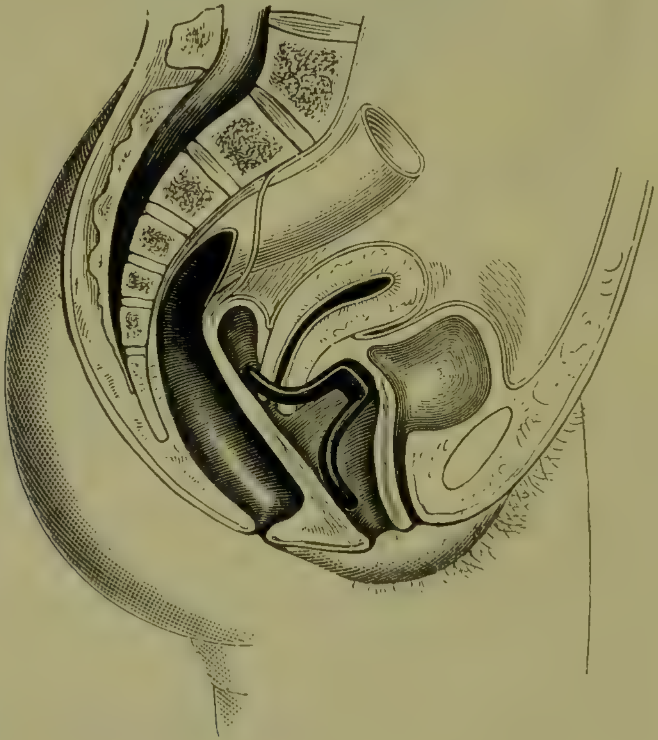

Fig. 165.—Cradle Pessary in Position.

like Gervis's (Fig. 147, p. 278). In prolapse of the posterior vagina wall, the same pessaries have a palliative effect, by stretching the posterior fornix, and by its means the whole posterior vaginal wall, upward. But it is advisable to repair the ruptured perineum, which is almost always the starting point of the descent.

In some cases of slight cystocele, especially if the uterus tends rather to anteversion than retroversion, one of the pessaries originally designed for anteversion or anteflexion may be of use, by stretching the anterior vaginal wall upward into a pouch. Among these is Graily Hewitt's cradle pessary (Figs. 164 and 165). This blocks the vagina against coitus, but the patient can generally place it and withdraw it herself. The author's pessary (Figs. 166 and 167) keeps up also the posterior fornix, and does not depress the cervix so much. It cannot be placed by the patient herself, but does not interfere with coitus as a rule.

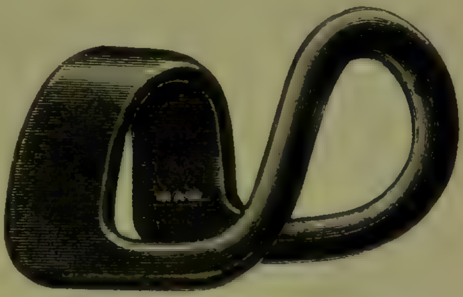

Fig. 166.—The AUTHOR'S Pessary or Cystocele.

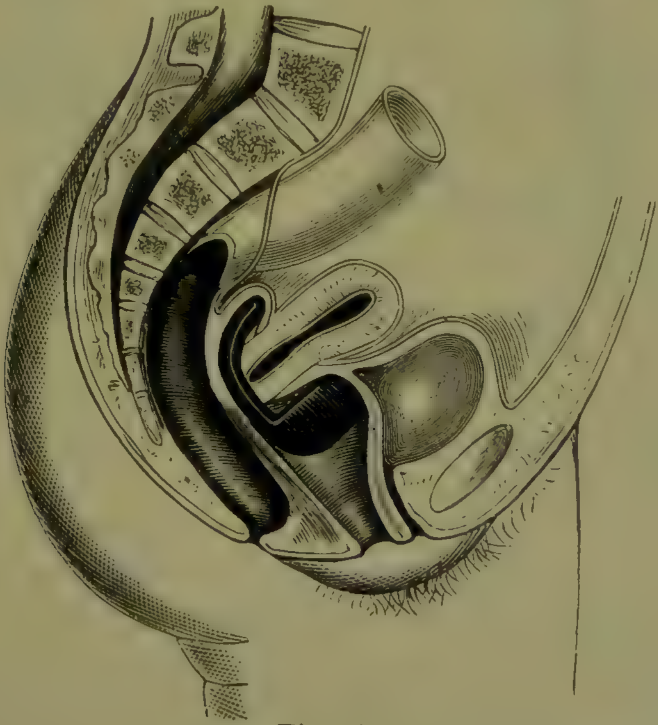

Fig. 167.
The AUTHOR'S Pessary for Cystocele in Position.

A form of instrument which will sometimes retain the uterus within the vulva, when no other will do so except by external support, is Zwancke's pessary. This consists of two plates, like butterflies' wings, hinged together, and capable of being expanded, either by a screw, or by two arms which are secured by a simple catch, as in Dr. Godson's modification, which is the best form of the instrument (Fig. 168). The pessary stretches the vagina laterally, and merely retains the cervix within the vulva, without tending to elevate it to its normal level, or remedy the retroversion or retroflexion; and, indeed, the lateral stretching of the vagina tends to keep the cervix depressed, and in contact with the pessary. It thus secures only a very partial alleviation, and most authorities justly denounce its principle as unsound. Some patients who have used it, however, derive from it so much relative comfort that they are not easily persuaded to change it for any other instrument. The cervix resting upon the hinge is apt to become inflamed or ulcerated, but this effect may be obviated in great measure if the pessary be so made that the hinge forms no projection. The chief advantage of the instrument is that the patient can easily remove it herself, and she should be stringently enjoined to do so every night. Through neglect of this precaution, rectal and vesical fistulæ have not infrequently been produced, and I have known death eventually follow, owing to burrowing pelvic abscesses. On the same principle act Simpson's shelf pessary, and a modification of this praised by Dr. Matthews Duncan, namely, the disc and stem pessary, the stem of which projects through the vulva, after the disc has been introduced like a button through a button-hole; but these are less easily removed by the patient herself than Zwancke's pessary.

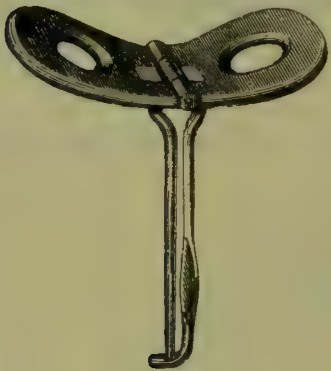

Fig. 168.
Zwancke's Pessary modified by Godson.

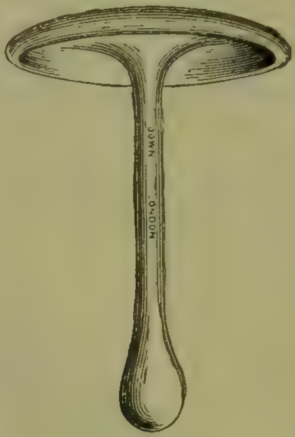

Fig. 169.
Disc and Stem Pessary.

The numerous old forms of pessary which kept up the uterus mainly by their bulk filling the vagina, such as globes or discs of wood or other materials, have properly fallen into disuse. One instrument, however, acting on this principle, is sometimes useful as a temporary expedient when, from the presence of a pelvic tumour or inflammatory swelling, neither a rigid pessary nor even the elastic ring can be tolerated, namely, the air-ball pessary. This consists of a hollow, spherical ball of india-rubber. A tube is attached, through which it is inflated by means of a small air-pump, and the patient can easily introduce and remove it herself. Owing to the material used, frequent removal is necessary for the sake of cleanliness.

If the lever or elastic ring pessary cannot be retained, it is generally best, in default of a plastic operation, to resort to the cup and stem pessary (Fig. 170), supported from a waist-belt by four bands. Before it is used, any ulceration present should be cured by rest. This pessary has the advantage of not stretching the vagina, and the patient will scarcely fail to remove it every night, at which time astringents may be used. The bands should be made of india-rubber tubing, not of uncleanly webbing as in the instruments commonly sold, and the pessary itself of vulcanite. Its lower end should be fixed in the centre of a square sheet of india-rubber of suitable width, to the corners of which the bands are attached, so that they may not cross the labia, but lie in the groove at each side. They will then not produce chafing. The stem may have a pelvic curve, if preferred (Fig. 171), but the straight instrument better corrects the tendency to retroversion by pushing the cervix backward. Pessaries of the same shape, made in red rubber, are sometimes useful when much tenderness is present, but their

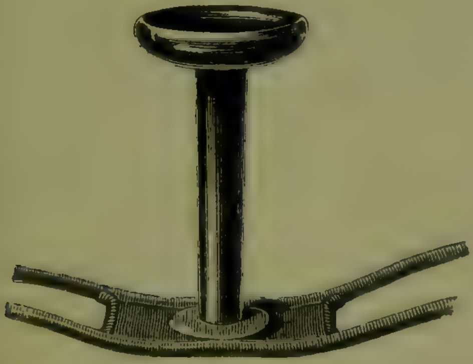
Fig. 170.
Cup and Stem Pessary.

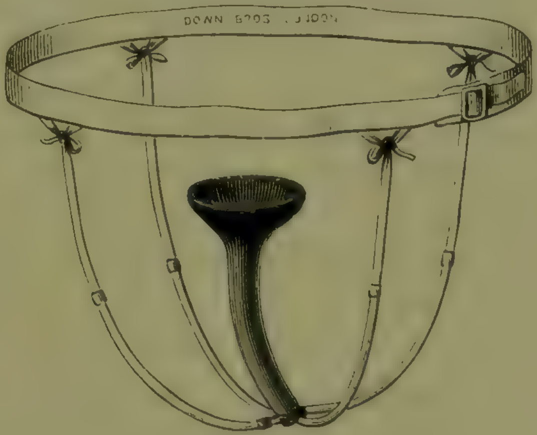
Fig. 171.
Curved Cup and Stem Pessary.

material is less cleanly, and they will scarcely resist a very powerful displacing force.

A drawback to the cup and stem pessary is that the cervix rests against the cup, and may become inflamed or abraded in consequence. As an alternative which avoids this disadvantage, the form of Cutler's pessary shown in Fig. 152, p. 288, may be used. The cervix is then held up through the medium of the posterior vaginal reflection. The pessary will be more securely kept in place if it has a double band for support, one passing forward, as well as one backward, to the waistbelt. Cutler's pessary, with a single band, is also made with a cup at the top to hold the cervix backward.

When a patient declines operative treatment, and objects to more effectual forms of pessary, some degree of comfort may often be attained by one of the utero-abdominal supporters which were formerly more used than at present. These consist of a belt combined with a padded metallic plate, fitted above the pubes or over the sacrum. A strap passing between the legs supports a perineal pad, which may succeed in keeping the uterus within the vulva, while the pressure of the plate tends to relieve sympathetic pains.

Operative Treatment.—In those cases of prolapse in which neither a ring nor any form of Hodge's pessary is available, the inconvenience of pessaries requiring bands and external support is so considerable that the patient, if not too old, should be advised to undergo some form of operation to improve her condition.

Many kinds of operation have been performed for prolapse, but it is true of all of them that the after-treatment is of as much importance as the operation, and should generally include the use of a pessary to keep the fundus at its normal level for some years, to give the utero-sacral ligaments the opportunity of recovering their tone. It is also necessary to avoid the causes which initially led to the prolapse: otherwise, recurrence is possible after any operation, except perhaps that for complete extirpation of the whole vagina as well as the uterus. This is not to be wondered at when it is considered that excess of intra-abdominal pressure alone may cause the most extreme form of prolapse in a virgin. It is not to be expected that the surgeon can make a pelvic floor or uterine supports better than Nature made them originally. As parturition is among the most important of the initial causes, and is apt to undo the effect of almost any operation, while some of the operations have an injurious effect on the course of pregnancy, it is sometimes advisable, if the patient is not suffering too much, to postpone operation till she has reached an age when further pregnancies are unlikely: she may then be rendered sound for the rest of her life. This principle does not apply to the repair of a ruptured perineum, which should be undertaken at any time. If a subsequent delivery ruptures it again, it can be restored by sutures applied immediately.

If there is hypertrophic elongation of the vaginal portion of the cervix, the elongation is probably the primary cause of the prolapse, and the only satisfactory treatment is amputation. Again, if there is general enlargement of the uterus and broadening of the vaginal cervix, especially when associated with laceration, even without any notable lengthening, it is often useful to perform on the cervix the plastic operation described in pp. 221—223. The alterative effect of the operation, and the rest in bed, cause a diminution of the uterus, which is afterwards more easily retained by a ring or other pessary.

Perineorrhaphy and Colporrhaphy.—In slight or early cases of prolapse, if it is found that the perineum has been destroyed or damaged in labour, and there is as yet no great general relaxation of the vaginal walls, it is desirable to repair the perineum by one of the methods described in Chapter XIII. This will render the vagina again a support to the uterus, or at any rate prevent its being a cause of displacement. Care must be taken not merely to make a thin perineum, but to restore the triangular shape (on longitudinal section) of the perineal body. This will facilitate the retention of a Hodge's or ring pessary, by which descent may be averted, although it will not generally by itself suffice to prevent it.

In more severe degrees of prolapse, in which the vaginal walls have undergone much stretching, it is much more effectual to perform colporrhaphy as well as perineorrhaphy. By this either the anterior or posterior vaginal walls, or both, may be narrowed. Of the two it is much more important to operate on the posterior wall, because the posterior wall, with the fibres of the levator ani which encircle it, normally supports the anterior wall, as the intra-abdominal pressure presses it downward and backward (*see* Fig. 2, p. 5). If the anterior wall alone is reduced, it is certain to stretch again under the influence of unsupported pressure. Even, however, after effective restoration of the posterior wall, an over-stretched anterior wall is apt still to bulge again through the narrowed vulval outlet. In most cases, therefore, it is best to operate on both walls at the same time.

Anterior Colporrhaphy.—Anterior colporrhaphy should be performed first. The patient is placed in the lithotomy position, with Clover's crutch or leg-rests attached to a table, and the vulva shaved and disinfected. The cervix is drawn down by vulsella so as to put the anterior vaginal wall on a stretch.

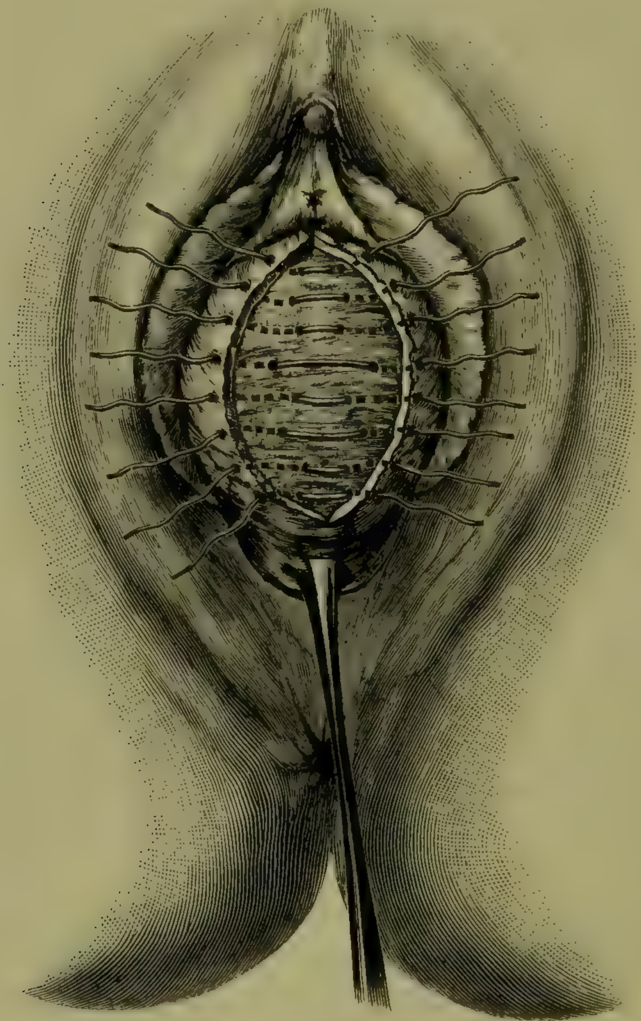

Fig. 172.—Anterior Colporrhaphy.

The surface to be denuded should be pointed at each end, bounded by segments of a circle, as shown in Fig. 172. The top is close to the cervix, the bottom at the point where the urethra ceases to be closely connected with the pubes. The area is first marked out by incisions with a scalpel through the mucous membrane. The apex next the urethra is then seized with forceps, and the whole marked-out area of mucous membrane dissected with scissors off the subjacent tissues, care being taken not to damage the urethra or wall of the bladder. The edges are then stitched together as shown in the figure; and it is an advantage to place the sutures alternately deeper and more superficial. If there is much venous bleeding, the stitching up may be commenced before the whole area is denuded. The sutures may be of chromic catgut, the ends cut short, and the sutures left to dissolve out.

With the view of limiting the hæmorrhage at the operation, Marion Sims denuded a V-shaped surface, and stitched the arms together; Emmet added transverse pieces to the ends of the V. These operations produce a pouch which may retain secretions, and afford a less wide basis of union. The operation above described produces a smooth and uniform vaginal wall.

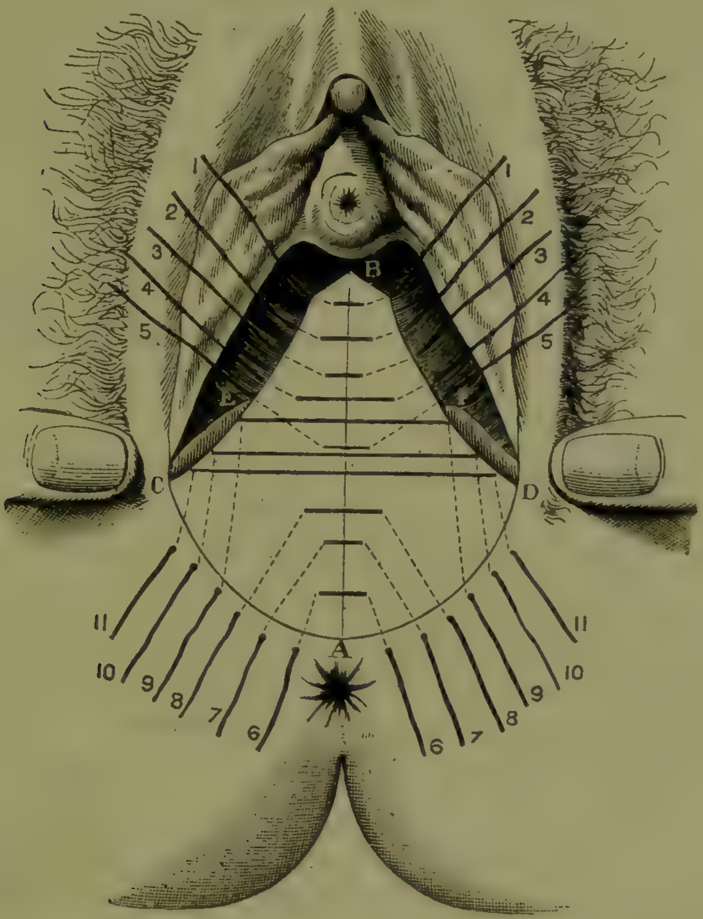

Fig. 173.—Operation of Posterior Colporrhaphy.

Posterior Colporrhaphy.—The mode usually adopted in performing this operation is shown in Fig. 173. The surface denuded may be either a triangle, as advised by Hegar, or a pentagon, as advised by Simon, and shown in the figure, the upper part of the denuded surface being completed by two incisions, meeting above at a very obtuse angle. The surface is freshened by knife or scissors, but it is better to use scissors toward the upper part if there is much bleeding. An incision may be made by scalpel through the mucous membrane from A to B, and from A to C. The triangle A B C is then seized with forceps at A, and dissected up from the apex A to the base C B. To facilitate the dissection, the skin margins at C and D are drawn outward by the fingers of assistants. The point A is drawn downward by a vulsellum, and a vulsellum is also placed upon the mucous membrane just above B, to draw the point B upward, and keep the line A B on a stretch. The flap is then cut off along the line C B, with the exception of a narrow edge C E, which is left to fall over and cover in the union of the perineum on its vaginal side. The triangle A B D is treated in the same manner, and any bleeding arteries secured with pressure forceps. The sutures are passed with curved Hagedorn needles. They are placed and tied up in the order of the figures. The vaginal sutures are alternately deeper and more superficial, and include the vaginal mucous membrane. They may be of chromic catgut, and may be left to dissolve out, the ends being cut short, or they may be of silkworm gut. In the latter case the ends of each suture are left long and tied together, the ends being tucked up in the vagina. They are removed after the perineum has consolidated, a week or more after the removal of the perineal sutures, and from fourteen to eighteen days after the operation. It is better to use silkworm gut if there is much tension, as is apt to be the case, toward E and F, where the vaginal union joins the perineal union. For removal of the sutures, the long ends are first drawn outside the vulva with the finger. A Sims' speculum is then passed with the handle towards the pubes, the patient being in the lithotomy position, close to a window with a good descending light. The sutures are then removed in order from below upward. The loop of each being drawn a little upward by means of the long ends, the point of sharp-pointed scissors is passed underneath the knot.

The posterior perineal sutures are brought out for a short space across the centre of the raw surface. The anterior perineal sutures are brought near the edge of the vaginal mucous membrane, but do not penetrate it. They are brought out just under the edge of the narrow upturned flap D F, and inserted again under the edge of the flap at C E. The perineal sutures are of silkworm gut. Their ends are left long, and those of each suture are tied together, a tie being finally placed round the whole bunch; the ends then do not prick the tender surfaces next the wound.

After the operation a vaginal douche of perchloride of mercury, 1 in 3,000, may be used twice a day. No dressing is placed on the perineal wound, beyond a loose pad of antiseptic wool to absorb any discharge; but it is carefully cleansed with a jet from a syringe after any action of the bowels, and may be then dusted with iodoform or aristol. The catheter should be used for the first two or three days, after which the patient may kneel up or turn over on her face to pass water, to avoid the risk of its running over the surface of union. The perineal sutures are removed at from seven to nine days.

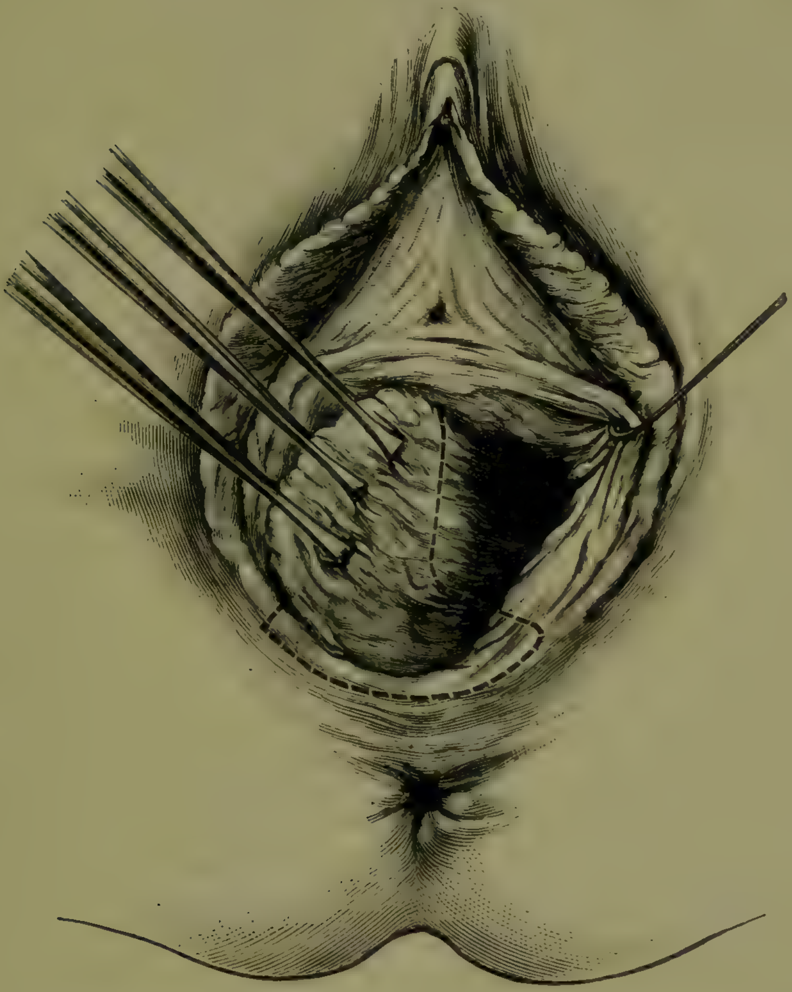

Fig. 174.
The AUTHOR's Operation of Posterior Colporrhaphy. First Stage.

In this operation most care is required in making sure that the edges near E and F come into exact apposition. The greater the resistance to be overcome, the more numerous should be the sutures, that the tension on each may be diminished. By the plan of making the upper extremity of the freshened surface end by a very obtuse angle, as shown in Fig. 173, p. 321, a sort of pouch is formed above the cicatrix, ending below in a transverse ledge by which the cervix may be retained instead of gradually distending the contracted part of the vagina.

Of late, I have adopted the method of operating for posterior colporrhaphy illustrated in Figs. 174-176. The object is to restore more completely the loop of the levator ani, surrounding the vagina at its centre, and forming its sphincter. In conditions of great relaxation, none of the muscle can be detected in the central part of the posterior vaginal wall, and it may have been entirely torn through in parturition, but some of it exists at the sides. In the ordinary operation, in which the mucous membrane only is removed, when the sutures are applied, the muscular wall of the vagina and any remnant of levator ani are thrown into a fold. This tends to unfold itself and stretch out the union. In this operation the incision is made quite through the muscular wall of the vagina as well as the mucous membrane, including the levator ani toward the sides where more of that muscle remains. The muscular edges are stitched directly together so that there is no fold, and a muscular ring is restored, capable of grasping the index finger. The only drawback to the operation is that, as the cellular tissue is laid open close to the rectal wall, more care is required to avoid injuring the rectum.

The operation is performed as follows: — The patient is placed in the lithotomy position. The prominent fold on the posterior vaginal wall is pinched up, and as much tissue as possible seized with three vulsellum forceps for about two-thirds or three-fourths of the distance up to the normal level of the cervix uteri. A finger in the rectum makes sure that the rectal wall is not included in the grasp of the vulsella. With sharp-pointed scissors the vagina is then divided from above downward, along the dotted line shown in Fig. 174, p. 323. The vaginal wall is first cut through at the apex of the area to be excised, laying open the cellular tissue between vagina and rectum. The point of the scissors is then kept close under the muscular layer as the lateral borders are divided, passing some way outside the fold pinched up with the vulsella. The pinching up of the fold aids considerably in showing how much may be removed, so as to allow the edges to be brought together without too much tension. Next, the cellular tissue between the vagina and rectum is carefully divided with scissors from above downward, the apex of the surface to be removed being pulled forward and downward as shown in Fig. 175.

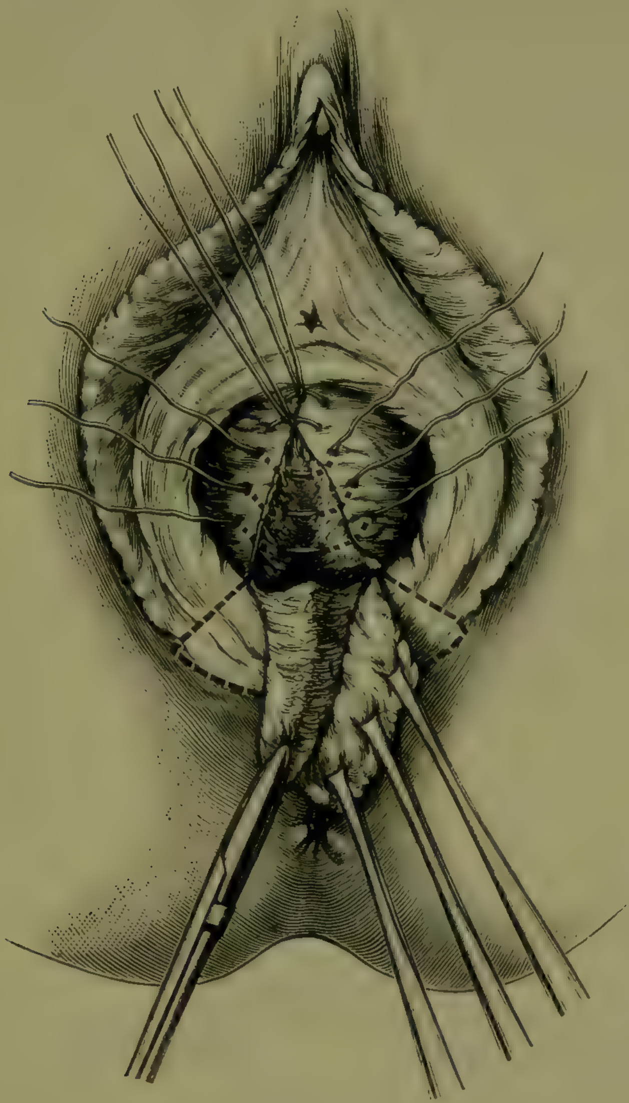

Fig. 175.
The AUTHOR'S Operation of Posterior Colporrhaphy. Second Stage.

Any arteries which spurt are secured with pressure forceps. Before the whole surface is separated, the upper vaginal sutures are inserted and tied up, each suture piercing vaginal mucous membrane and muscular layer with some lateral cellular tissue on each side, and folding back the central cellular tissue into a pouch (Fig. 175). If there is much venous bleeding, only a very small portion of raw surface may be exposed at a time.

The dissection may be continued in the same way down to the edge of the perineum, or the upper part of the flap may be cut off by a transverse incision, and the lower part of the surface freshened by the scalpel, as in ordinary perineorrhaphy. A set of perineal sutures are placed below the vaginal sutures, leaving no gap between them. The number of these varies according to the extent of the surface, but is generally greater than is shown in Fig. 176. They are introduced by a curved Hagedorn needle. The posterior sutures are brought out so as to cross the centre of the raw surface for a short space, and are passed in again at a corresponding point on the other side. They just include the cutaneous margin on both sides. The anterior are brought out on the raw surface, just under the cut edge of the vaginal mucous membrane (Fig. 176), and cross to the corresponding point on the other side, to be brought out on the perineum again in the reverse order.

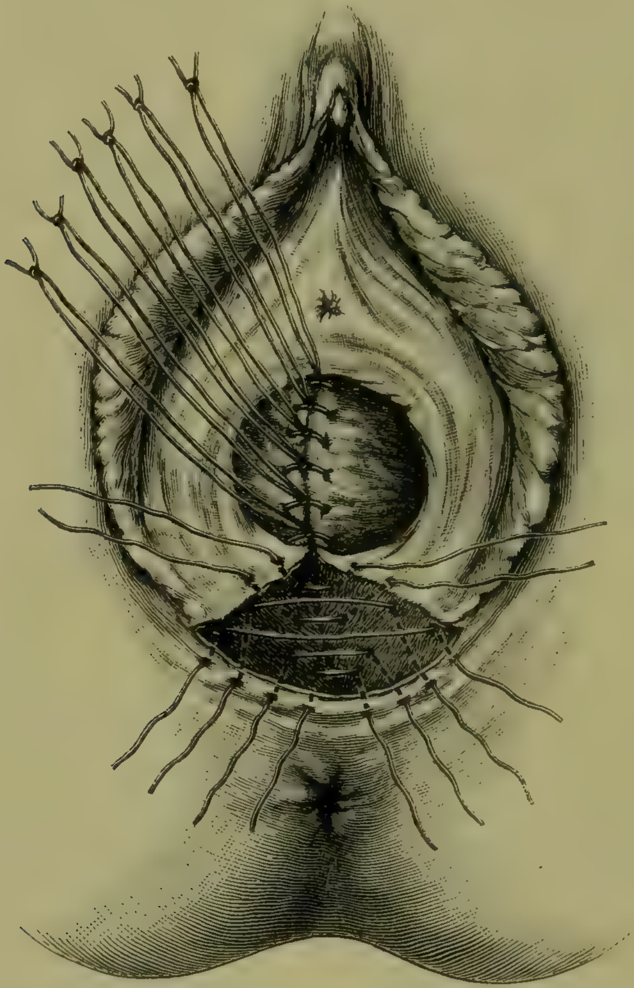

Fig. 176.
The AUTHOR'S Operation of Posterior Colporrhaphy. Third Stage.

When all the vaginal sutures have been tied from above downward, the perineal sutures are tied from behind forward The vaginal sutures are left long, the ends of each knotted together, and tucked up into the vagina. The perineal sutures are treated as described at p. 323. At the end of the operation the vagina may be lightly plugged with moist iodoform gauze, 10 per cent., to keep pressure upon, and prevent effusion taking place in. the infolded pouch of cellular tissue. The plug may be removed at forty-eight hours, and douches afterwards used, as described at p. 323. The perineal sutures are removed at about a week, the vaginal sutures at about a fortnight, in the manner described at page 322.

As compared with the operation next to be described, this one has the advantage that the portion of vaginal wall removed is that where the muscular layer is weakest and most over-stretched; and that it is shorter to cut away one projecting fold of vagina, than to freshen triangular surfaces in the two depressed sulci at the sides. The surface removed may be made much wider toward the bottom than shown in the figure, if the case demands it, and thus the outlet be more narrowed.

The following operation is also intended to restore the action of the levator ani, and was devised by Emmet for the repair of incomplete rupture of the perineum accompanied by submucous rupture of that muscle. It is most adapted for cases in which these conditions have led to a relaxed and gaping vulval outlet, with tendency to cystocele and rectocele. It is not, in my opinion, so effective as the last when there is also serious prolapse of the uterus, and it is desirable to narrow the vagina nearly up to the level of the cervix uteri.

In Emmet's operation the surface usually denuded for perineorrhaphy is extended up the vagina by adding to it two triangles lying in the lateral sulci, thus leaving a central tongue of mucous membrane projecting from above.

It is performed as follows. The central median ridge of the vagina is seized in the centre with a vulsellum, and drawn upward and forward toward the pubes. Vulsella are also placed at the lateral margins of the vulva inside the nymphæ at the points to which it is desired to extend the perineum, and are likewise drawn forward (Fig. 177). This will make manifest the lateral sulci as two gutter-like folds. Approximation of the two lateral vulsella to the one in the central ridge will show how the tissues are finally to be infolded and approximated. The incision to map out the space to be denuded is carried from the lateral vulsellum diagonally upward to the bottom of the sulcus, then downward from the bottom of the sulcus to the central vulsellum. This marks the sides of one lateral triangle. It is then carried from this same central point upward to the bottom of the other lateral sulcus, and thence downward to the other lateral vulsellum. This marks the sides of the second lateral triangle. Finally, an incision is carried from one lateral vulsellum to the other, round the margin of the vulva. This completes the marking out of the surface. The surface thus outlined is then denuded, after which the central vulsellum is drawn down to the level of the lateral vulsella.

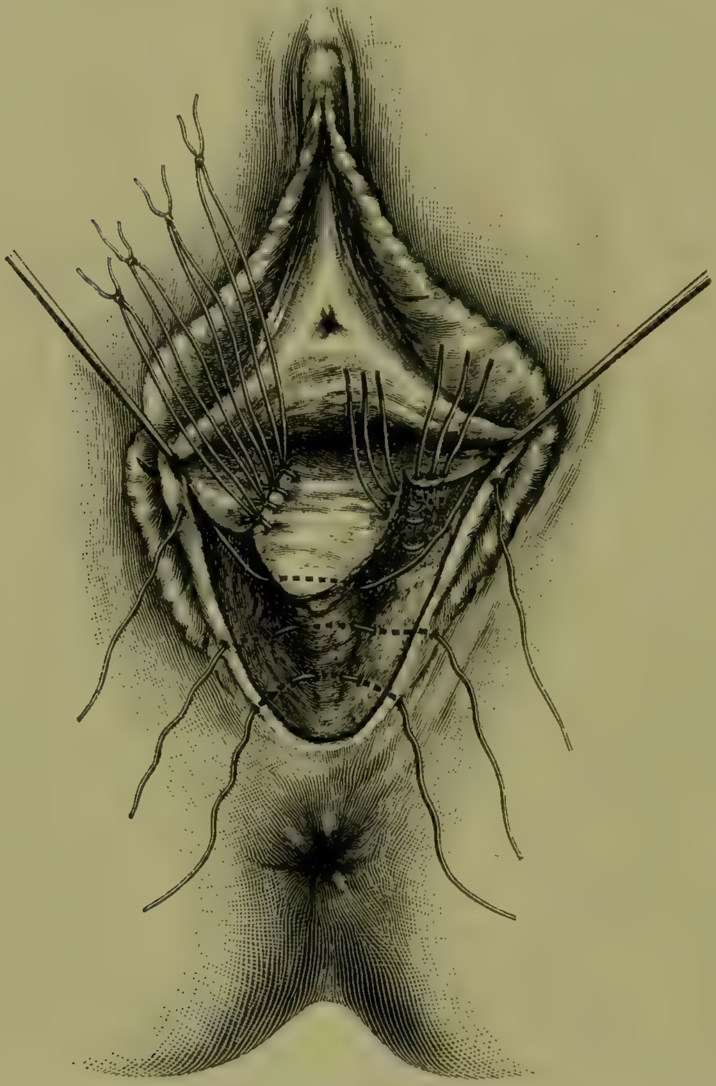

Fig. 177.
Operation for Relaxed Vaginal Outlet. First Stage.

The sides of the lateral triangles are sewn together by interrupted sutures of chromic catgut, left to dissolve out. They are placed about a quarter of an inch apart, and inserted and brought out an eighth of an inch from the margin of mucous membrane (Fig. 177). After these have been inserted on both sides, the most important suture, described as the "crown suture," is passed. It is inserted just below one lateral vulsellum, passing deeply enough to take up the levator ani muscle. It is brought out on the denuded surface, crosses the base of one lateral triangle, and is then passed through the cellular tissue underlying the base of the central mucous tongue. It then crosses the base of the second lateral triangle, is inserted on the denuded surface deeply enough to again take up the levator ani, and is brought out on the cutaneous surface just below the second lateral vulsellum (Fig. 177).

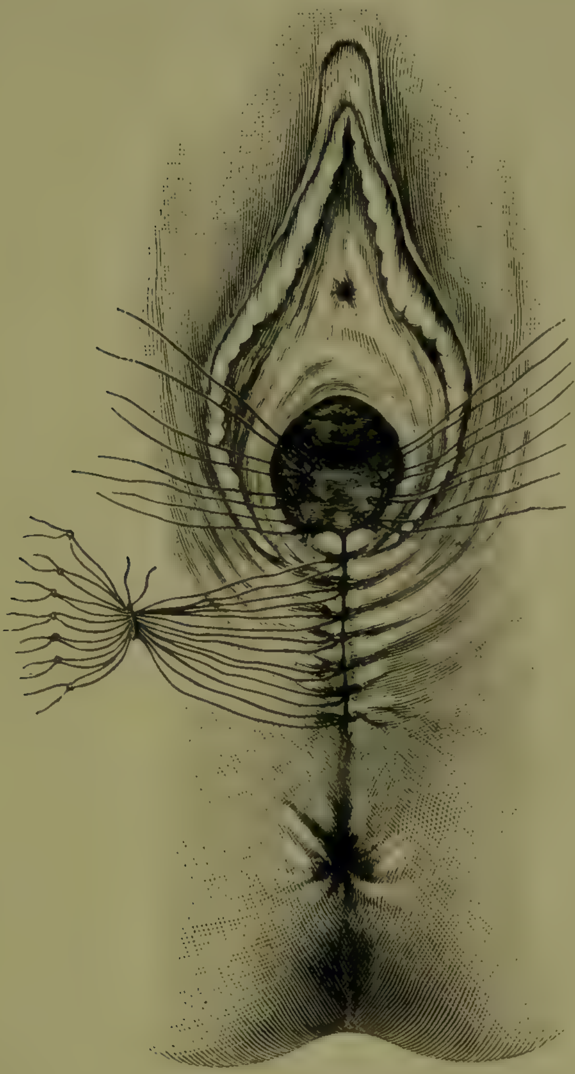

Fig. 178.
Operation for Relaxed Vaginal Outlet. Completed.

Interrupted sutures are now passed (of which two only are shown in Fig. 177), at intervals of about a quarter of an inch, between the crown suture and the central point of the perineum. Each of them takes up in the centre a short piece of the cellular tissue intervening between the tip of the central tongue and the central point of the perineum. The sutures are now tied, from apex to base of first one and then the other lateral triangle, and finally the perineal sutures from behind forward, ending with the crown suture. The resulting line of union resembles the letter Y (Fig. 178), the tip of the central mucous tongue being fixed by the "crown suture" to the margin of the extended perineum.

As compared with the author's operation, this has the advantage that the incisions do not go quite so close to the rectum, nor is so much inverted pouch of cellular tissue left in which effusion might possibly take place. It is evident, however, that it shortens the loop of the levator ani, not, as in the author's operation, throughout the central part of the vagina, but only near the vulval outlet, by the "crown suture"; and that even there the ends of the muscle presumed to be ruptured are not united immediately to each other, but only through the medium of the central mucous tongue.

After any of these operations it is necessary to prevent the axis of the uterus remaining in the line of the vagina in a retroverted position; otherwise it will gradually stretch the contraction and descend again. This generally means the continued use of a small Hodge's or ring pessary for a year or two at least, till the utero-sacral ligaments have recovered tone. If, however, a ventral fixation, or shortening of the round ligaments, is carried out at the same time or shortly after, so as to keep the uterus in a position of anteversion, the pessary may often be dispensed with.

Le Fort's Operation.—This operation consists in uniting the vagina by a median septum, so as to make an artificially double vagina. In suitable cases it is, according to my experience, the most successful of all operations for the cure of prolapse of the uterus and vagina. It is the only one after which I have never yet met with any relapse, though I have performed it in cases in which ventral fixation had failed. It is most adapted for widows or unmarried women, and I have performed it only in such cases. Either side of the double vagina, however, has appeared to be capacious enough for coitus. The originator and other operators have performed it for married women, and found that coitus is not prevented. This might be expected from the experience of a naturally double vagina, which does not usually interfere with married life. The septum would, however, interfere with parturition, and the operation is therefore not available before the menopause.

The operation is performed as follows:—The cervix is drawn down, so as to invert the vagina as much as possible (Fig. 179). An oblong surface A B, an inch or more wide, is mapped out with a scalpel on the anterior vaginal wall. The point A should be about an inch above (in the natural situation of the parts) the urethral orifice, the point B about half an inch below the insertion of the anterior vaginal wall into the cervix. It is better to make A at first a little too high rather than too low, since the surface can be extended downward toward the meatus urinarius, if necessary, at the end of the operation. The oblong so marked out is then denuded with scissors. Another oblong, equal in length and breadth, is then marked out on the posterior vaginal wall, and the essential point in the operation is so to locate it that when the uterus is returned, and the two surfaces united, the parts come into their natural relations. A′, which is to come into contact with A, should be a short distance above the perineum,

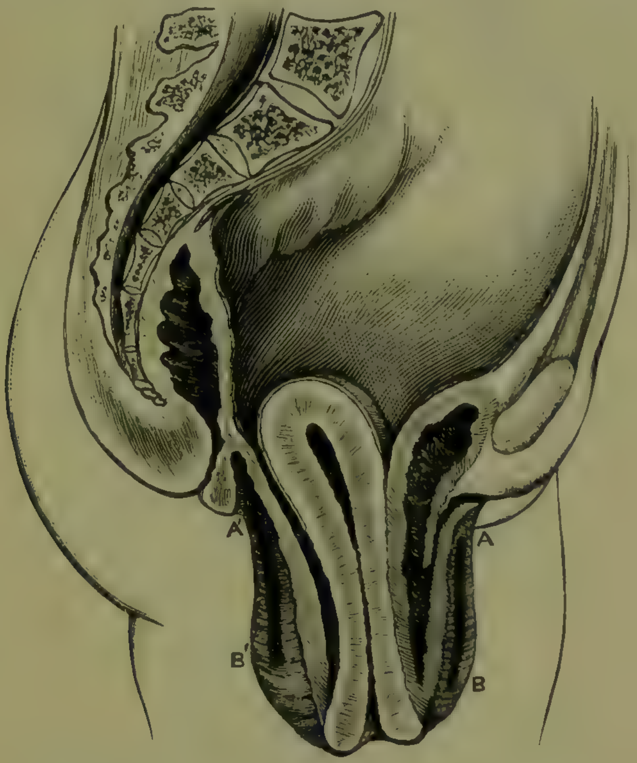

Fig. 179.
Le Fort's Operation for Uterine Prolapse. First Stage.

leaving only enough space between to allow a firm perineum to be restored after the median septum has been made. B′, which is to be united to B, must be at a greater distance from the posterior insertion of the vagina into the cervix than B is from the anterior insertion, to allow room for the reconstitution of the posterior vaginal fornix.

After denudation of the posterior oblong the first suture is inserted close to B with a straight needle. It is passed, including the vaginal margin, as close as possible to the edge, and brought out on the denuded surface, about $\frac{1}{4}$-in. from the opposite side of the oblong. It is then carried to B′, and brought through in the reverse order, entering the denuded surface $\frac{1}{4}$-in. from the margin, and including the edge of the vaginal mucous membrane at its exit. All the sutures may be passed in this way before any are tied. But it is generally easier to tie them, and cut them short in

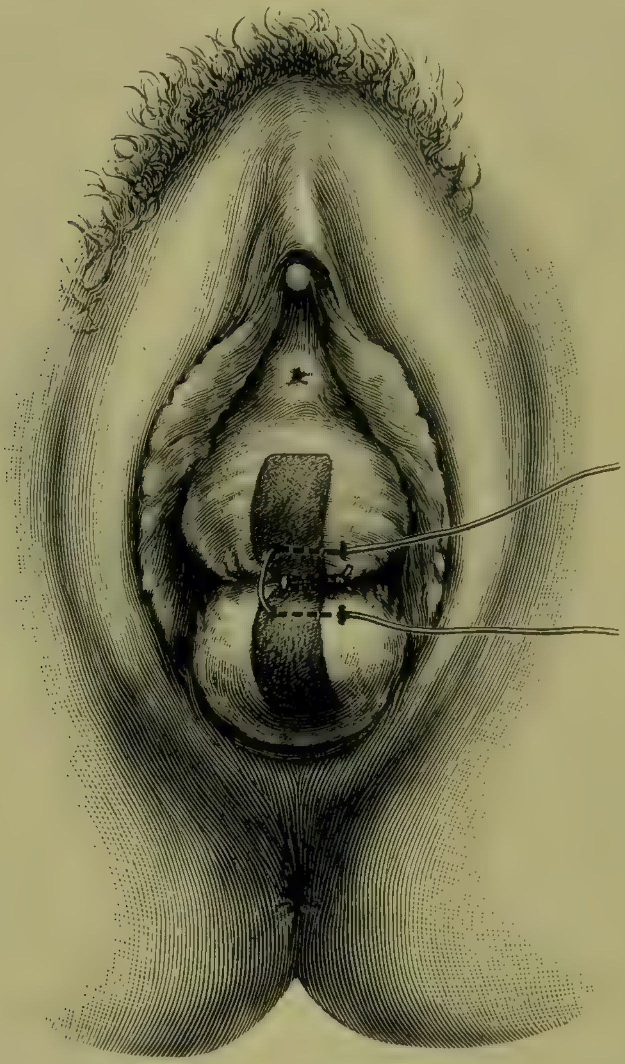

Fig. 180.
LE FORT'S Operation for Uterine Prolapse. Application of Sutures.

succession, as shown in Fig. 180, the uterus and vagina being gradually restored to place as the operation proceeds. The sutures are of chromic catgut, and are left to dissolve out. When the last suture has been passed, uniting A to A′, a perineorrhaphy is performed to narrow the vulval outlet, and make a firm perineal body supporting the median septum.

This operation prevents primary descent of the uterus by the median septum lying directly in the way of the cervix, and keeping the cervix back, and the uterus therefore in anteversion. It prevents primary descent of the vaginal walls, which might draw down the uterus, by preventing the sliding of one wall upon the other, and separation of the walls from each other from below upwards, which are essential elements in prolapse of the vagina.

Some operators use a double row of sutures, one at each side of the oblong, bringing out each suture on the denuded surface, and passing it in again on the other, a little short of the centre. I have found the single row, as shown in Fig. 180, quite sufficient. One great advantage of the operation, especially for old women, is that no pessary is required afterwards.

Abdominal Fixation of the Uterus.—A vaginal fixation of the uterus, or shortening of the round ligaments, tends to a certain extent to counteract prolapse by preventing retroversion, and in this way may replace the effect of a pessary. But it does not prevent it in bad cases, since the uterus may descend even in a partially anteverted position, describing a circle around the pubes. Abdominal fixation, provided that the point of fixation is chosen fairly high up and not too close to the pubes, is a more effective operation, since it not only prevents retroversion, but directly holds the uterus up. In most cases sufficiently bad to justify an abdominal section in the hands of an aseptic surgeon it is the best thing to do. It should always, however, be combined with an effective colporrhaphy, either at the same time or shortly after; otherwise the vaginal walls descend again, and draw down the uterus. Abdominal fixation may fail in one of two ways. (1) The surface of union may lengthen out into a band, and allow the uterus to descend. (2) The uterus may be simply stretched out by traction, so that the cervix descends as far externally as before, though the fundus remains firmly attached to the abdominal wall. I have known the length of the uterine cavity, which was 4½-in. before the ventral fixation, stretched out to 6½ or 7-in. afterwards, and the procidentia of cervix reproduced.

The operation of abdominal fixation has been already described (*see* p. 296). After the operation, combined with colporrhaphy, a pessary may often be dispensed with, provided that the patient is kept under observation, so that a pessary may be inserted if any sign of descent reappears.

Vaginal Hysterectomy.—Prolapse of the uterus being regarded as essentially a form of hernia, removal of the uterus is not a logical treatment for it. It simply removes the organ from the centre of the hernial sac, which may come down as much without it as with it, and it takes away the resource of abdominal fixation, whereby the centre of the sac is fixed up to the abdominal wall. If the operation cures, it mostly does so by causing adhesions; and thus, the more aseptic the operation, the more likely it is to fail. Hysterectomy therefore is only advisable in exceptional cases, in which the size in all dimensions, and weight, of the uterus, not merely its lengthening, appear to be an important element in the causation of the prolapse. In some such cases I have found the result better than might logically be expected. I have not, however, simply removed the uterus. After its removal, instead of stitching up the gap in the peritoneum in the usual way in a transverse line, I have stitched together with chromic catgut the pedicles formed by tying the upper halves of the broad ligaments, at a level above the ligatures. In this way is formed a strong transverse band across the pelvis, constituted by the shortened broad ligaments deprived of the uterus, which becomes adherent to the top of the vagina and holds it up. After this operation an effective anterior and posterior colporrhaphy should be performed before the patient is allowed to get about.

The removal of the whole vagina as well as the uterus has been recommended by Edebohls. After removal of the uterus by vaginal hysterectomy, the vagina also is excised, and the gap stitched up in stages by buried sutures. This operation appears radical, but very severe. It is doubtful whether it is more effective than Lefort's operation, and it is more objectionable than that operation, in that it completely abolishes the sexual function.

Shortening of the Utero-Sacral Ligaments.—The utero-sacral ligaments are the most important structures holding up the uterus, and their lengthening the most essential condition for uterine prolapse. Shortening of the utero-sacral with the round ligaments would therefore be the most rational method of treatment, and would involve the least possible departure from normal relations. Unfortunately, the fibrous bands constituting the true utero-sacral ligaments, and lying deeply in the broad ligaments, cannot be shortened satisfactorily by operation, although the peritoneal folds over them can be. A result similar to that of shortening the utero-sacral ligaments has been aimed at by stitching together the anterior and posterior layers of peritoneum at the sides of the pouch of Douglas. For this operation the patient must be placed, with the pelvis raised, in the extreme Trendelenberg position, and a median abdominal incision made, long enough to allow the intestines to be turned entirely out of the pelvis and held back by a sterilized pad. Buried sutures are then inserted by curved needles at the sides of the pouch of Douglas, uniting its anterior and posterior layers, care being taken not to wound the rectum. At the same time the peritoneal fold which forms the lateral border of the pouch of Douglas may be held out by forceps applied at its centre in the same way as the round ligament in Fig. 153, p. 292, and shortened in a similar way by stitching it together with as much as possible of fibrous tissue beneath. The fold on the other side is treated in the same way. Intra-peritoneal shortening of the round ligaments may conveniently be carried out at the same operation.

Inglis Parsons has practised an ingenious plan for attaining the same end without abdominal section. He injects into the broad ligaments on each side 12 grains of quinine dissolved in 30 minims of dilute sulphuric acid, with 30 minims of water, with the object of setting up cellulitis, and so producing cicatricial bands, such as often partially fix and hold up the uterus after cellulitis following labour. In a vigorous patient one injection may be enough; in an anæmic patient two or three may be required, at three weeks' interval. The uterus is meanwhile kept up by a rubber cup and stem pessary secured by bands. It is recommended that the patient should be kept in bed for from one to three months.

Further experience is required as to the permanence of the results thus obtained. It would seem that to produce a cellulitis sufficiently severe to cause permanent cicatricial contraction must be a more painful process to the patient than an aseptic operation.

A similar result has been arrived at by the injection of paraffin into the cellular tissue, as in the operation for improving the shape of the nose, so as to produce a solid mass to hold up the uterus and vagina. There seems to be some risk that the paraffin may set up irritation, and interfere with the venous circulation. The operation is, of course, not available if pregnancy is possible.

ANTEVERSION OF THE UTERUS.

Pathological Anatomy.—By anteversion of the uterus is generally understood an anteversion of the fundus in reference to the axis of the pelvic brim, which is considered to represent the normal mean position of the uterine axis. But, when the bladder is empty, the uterus lies normally in a position of combined anteversion and anteflexion, the flexion predominating in the nulliparous uterus, the version in the parous. It is normal also for the fundus uteri to be in contact with the bladder when the bladder is partially or considerably filled. Only a very slight degree of anteversion therefore can possibly exist beyond the natural limit of the normal position; and anteversion must always be remedied, partially or wholly, when the bladder is filled.

A great number of symptoms have been attributed by some authorities to anteversion; but it is now generally agreed that anteversion of a uterus otherwise normal is not pathological.

Causation.—Anteversion of an unusual degree simply means that the uterus is more rigid than usual, and that its size and weight are for some reason increased, while the utero-sacral ligaments are not relaxed so as to allow it to descend in the pelvis and at the same time become retroverted. The usual causes of this are subinvolution and hyperplasia, often associated with endometritis, which has produced or maintains them. Another cause of anteversion is moderate enlargement of the uterus, due to the presence of one or more small fibroid tumours in its walls. Any excess of abdominal pressure, as from tight-lacing or weight of clothing, increases in such cases the degree of anteversion when the bladder is empty.

For, when the uterus is already partially anteverted, the intra-abdominal pressure, acting downward in the axis of the pelvis, falls mainly on the posterior wall of the uterus, and presses it down upon the bladder. If there are adhesions from perimetritis in the anterior fossa of peritoneum, the uterus may be adherent to the bladder, and bound down more or less in a position of anteversion. Adhesions are, however, rare in this situation as compared with the posterior fossa behind the uterus, because the constant movements of the bladder through its varying degrees of fulness tend to prevent them or separate them.

Results and Symptoms.—Anteversion in itself generally produces no symptoms, and symptoms associated with it are most frequently due rather to the hyperplasia, hyperæmia, or inflammation which was anterior to the displacement. If, however, the displacement is considerable, and the uterus is also large and hard, especially if the enlargement is due to the presence of a fibroid tumour, signs of pressure upon neighbouring organs may appear. When the cervix especially is enlarged and indurated, and particularly when the whole uterus is at the same time far back in the pelvis, pain in defæcation and rectal tenesmus may be produced. Bladder symptoms have been attributed to the pressure of the anteverted fundus. But vesical tenesmus, when it exists, is much more frequently a reflex effect from congestion of uterus or ovaries than produced by mechanical pressure. If, however, the uterus is bound down by adhesions in anteversion, pain may be produced by the filling of the bladder.

Diagnosis.—By vaginal touch the os is found to be directed too much backward and high up in the hollow of the sacrum, so that in extreme cases it can with difficulty be reached. The anterior vaginal wall is tense, from the traction exercised by the cervix, and more than usual of the body of the uterus is felt resting low down upon it. On bimanual examination, the body of the uterus is readily defined in this position, the fundus being close behind the pubes when displacement is considerable. No concavity or angle is detected by the finger in the vagina between cervix and body. If no adhesions or tumour be present, the fundus may be pushed up by the finger through the anterior cul-de-sac until the external hand, pressed immediately above the pubes, is able to get below it, and carry it still farther back, while the finger in the vagina draws the cervix forward. In simple anteversion the sound is hardly ever necessary either for diagnosis or replacement, though it may be of use to determine the degree of enlargement, or to decide as to the presence or absence of a fibroid tumour. It is to be remembered that when the examination is made in the dorsal position, the degree of anteversion will generally be less than that which exists in the erect posture.

Treatment.—Anteversion is generally rather the indication of increased weight of the fundus uteri than the cause of symptoms in itself. Moreover, there is no possible pessary for anterior displacements which is either so effective or so free from any injurious influence as the Hodge's or ring pessary in backward and downward displacements. Hence it is only very exceptionally that mechanical treatment is found useful in anteversion, and generally it is preferable to direct the treatment rather to the cause of enlargement. Any acute symptoms of hyperæmia should be relieved by rest in bed, aperients and sedatives, with local depletion if required. In this, as in other displacements, all tight clothing should be forbidden, and the skirts should be suspended from the shoulders.

A great variety of vaginal pessaries has been devised for the treatment of anteversion or anteflexion. Most of these have a double action, like those used for retroflexion. By pressure on the anterior vaginal wall they directly push up the fundus, and at the same time they render that wall arched, and so shorten it by bringing its extremities nearer together, and thereby draw the cervix forward. The base of the bladder, however, appears to be more vulnerable to injury from any considerable pressure than the posterior cul-de-sac. It is obvious that the fundus can only be directly elevated by such pessaries by means of pressure transmitted through the bladder; and that the bladder must suffer at least as much, if not more, pressure from the pessary as it would from the anteverted or anteflexed fundus.

Moreover, all these pessaries, occupying mainly the lower part of the vagina, form an obstacle to coitus, and are liable to extraordinary displacements in married women. Accordingly the preponderance of experience appears to show that anteversion pessaries more often do harm than good. The usual harmlessness of anteversion in itself is shown by the fact that, when a Hodge's pessary is acting most satisfactorily for the cure of a backward displacement, the uterus is often found in a position of anteversion.

In some cases of anteversion associated with congestion, benefit is found from the use of a Hodge's or elastic ring pessary, notwithstanding that the pessary tends rather to increase the anteversion. In such a case the pessary probably does good by somewhat elevating the whole uterus, and limiting its mobility.

ANTEFLEXION OF THE UTERUS.

Pathological Anatomy.—A slight or moderate anterior curvature of the uterine axis is normal in the nulliparous uterus, and, when the uterus is soft, an increased anteflexion, instead of merely an anteversion, of the uterus is produced when the bladder is empty. A pathological anteflexion, therefore, only exists when the curve is very considerable as a whole, or very sharp at one part of the uterine axis, or when the uterus is rigidly fixed in its maximum position of anteflexion, so that the flexion is not diminished as the bladder fills, or when the uterus is pushed up by the finger from the anterior vaginal fornix. Angles up to about 60° between the direction of fundus and cervix may be considered as within the normal limits, provided that the curve is not too abrupt. The flexion is abnormal, if not pathological, when the angle reaches or exceeds 90°, as in the uterus drawn from a photograph in Fig. 182, p. 340; and still more when it approximates to 180°, as shown diagrammatically by the line C D in Fig. 181. In the uterus shown in Fig. 182 the angle would probably approximate to 120° when the fundus was pressed down during life by the intra-abdominal pressure on an empty bladder, although the direction of the os is not so much displaced forwards as is sometimes the case. Acquired anteflexion may be combined with anteversion, so that the os is tilted too much backward, the uterus having partly yielded as a whole to the displacing force, and partly undergone bending. In primary anteflexion the os is most frequently directed too much forward.

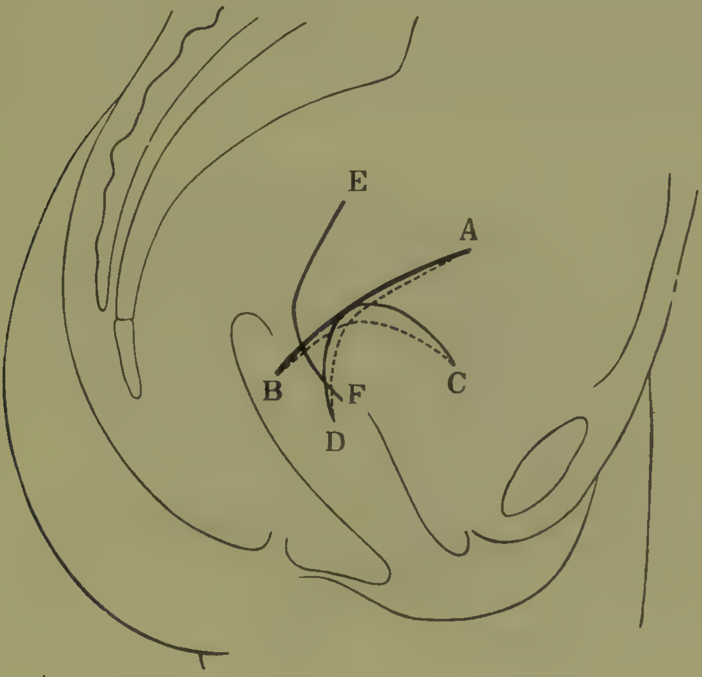

Fig. 181.—Diagram to illustrate the Varieties of Anteflexion.

A B, normal direction of uterine axis, the bladder being in a medium condition of fulness; A D, cervical anteflexion; C B, corporeal anteflexion; C D, cervico-corporeal anteflexion; E F, anteflexion with retroversion.

Anteflexion has been divided into corporeal, cervical, or cervico-corporeal anteflexion, according as the body alone, the cervix alone, or both cervix and body, are flexed forward (Fig. 181). Anteflexion combined with retroversion may also exist, the axis of the uterus being concave forwards, but its body displaced backwards (Fig. 181, E F). Such a condition is apt to be mistaken for pure retroversion, when a portion of the body of the uterus is felt behind the cervix. In acquired anteflexion the curvature is generally sharper at one point, usually near the internal os, because this is the most flexible portion of the uterus, and the canal is apt to be here flattened, and so obstructed (*see* Fig. 182). In primary anteflexion the curve is generally more uniform, and the uterine tissue harder, so that there is not necessarily any flattening of the canal, though its diameter is usually less than normal. Statistics vary very widely as to the relative frequency of anterior and posterior displacements of the uterus. The general opinion is, however, that anterior displacements, especially primary anteflexions, are much commoner, but that, of displacements of any consequence, descent and retroflexion are the most common. The discrepancy is explained, in great measure, by the difference between various authors as to the degree of anteflexion which they would regard as pathological.

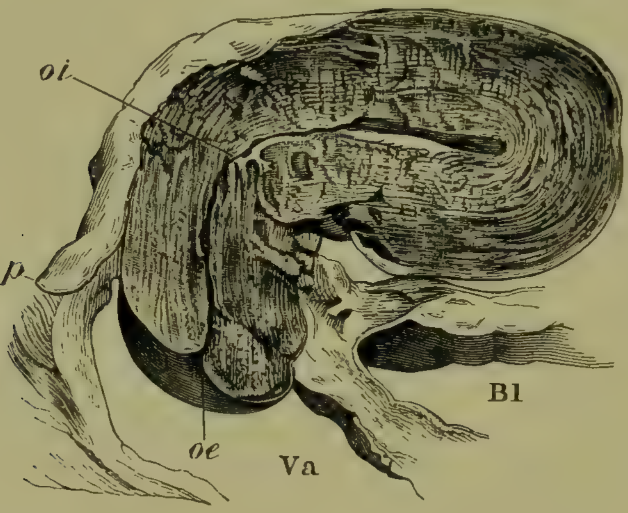

Fig. 182.—Anteflexion of Uterus.
o i, os internum; *o e*, os externum; *p*, peritoneum of pouch of Douglas; Bl, bladder.

Causation.—Before the age of puberty it is normal, or at any rate very common, for the uterine axis to have a greater physiological anteflexion than it has in the adult, while it straightens itself when the uterus reaches its full development and becomes firmer. Hence anteflexion is very frequently primary, and consists in an abnormal persistence or exaggeration of a state which, in childhood, is hardly to be considered pathological. In this case the anterior uterine wall is often thinner and less developed than the posterior; the anterior lip of the cervix is usually too short, and frequently the anterior vaginal wall is itself short. Such a condition is often associated with a conical cervix and small external os, and sometimes with general smallness of the whole uterus. Frequently there are also signs of imperfect ovarian activity; the vagina may itself be small, and even the bony pelvis may share in the want of full development. Acquired anteflexion, or an increase in a primary anteflexion, is to be attributed in most cases to an excessive intra-abdominal pressure, as from the wearing of corsets, when associated with a firm condition of the utero-sacral ligaments, and a sufficient softness of the uterine tissue to allow it to become bent instead of simply becoming anteverted. This may be merely the normal softness; but, if there is abnormal softness, such as results from malnutrition, anæmia, and general want of muscular tone, the flexion is more readily produced. The intra-abdominal pressure does not act on the uterus quite like a general fluid pressure which penetrates into all clefts and narrow spaces, but is made up of the pressure of individual intestinal coils, and acts most where there are most, not reaching spaces where no intestines are lying. Hence, when the uterus is lying, with a normal or primary anteflexion, its fundus in contact with the bladder and no intestines between, the intra-abdominal pressure falls mainly upon the back of the fundus, and tends to increase the flexion of the fundus forward. It also presses the whole uterus downward in the direction of the axis of the pelvic brim. The utero-sacral ligaments being the strongest and the least elastic supports of the uterus, the result is that the centre of the uterus, near the position of the internal os, where these are attached, rotates downwards and backwards about a centre corresponding to a transverse line between the attachments of the ligaments to the sacrum. The cervix uteri is consequently pressed against the posterior vaginal wall, and this pressure, especially if the cervix is long and conical, tends to produce or increase a cervical anteflexion, and turn forward the external os into the line of the vagina.

If, after a time, the utero-sacral ligaments lengthen, the uterus descends somewhat, becoming retroverted as usual as it does so, and then results the combination of anteflexion with retroversion. The same combination may occur if a primarily anteflexed uterus becomes simply retroverted. A very long conical cervix may turn forward in the vagina into the line of least resistance, even in the absence of any abnormal pressure, and so constitute a cervical anteflexion.

Anteflexion has been attributed by Schultze mainly to a *posterior parametritis*, which shortens the utero-sacral ligaments, and drags the centre of the uterus backward. It is obvious that, when such shortening exists, it will increase the effect of the intra-abdominal pressure above described. It may occur from a primary parametritis, but more often from a parametritis secondary to tubal inflammation with perimetritis, since this generally affects both sides and not one only. and involves especially the posterior part of the broad ligaments, including the utero-sacral ligaments. Posterior parametritis, however, can scarcely account for the anteflexion often found in virgins, who are not likely to have had parametritis. For the view appears unlikely which some hold, namely, that the kind of endometritis which may affect virgins, apart from any operative interference, is severe enough to spread through the uterine wall and involve the cellular tissue sufficiently to cause contracting cicatricial bands. Moreover, thickening of the utero-sacral ligaments is not generally to be felt in such cases.

Anteflexion may be produced by the weight of a small fibroid in the anterior uterine wall, just as a fibroid in the posterior uterine wall may cause retroflexion, but there is not room for it to produce so great an effect.

Results and Symptoms.—The importance of anteflexion has been one of the most controverted points in gynæcology, and the matter is still far from settled. It is generally agreed that the majority of virgins have a moderately anteflexed uterus when the bladder is empty. It is in reference to more extreme forms of flexion, such as render it rather a difficult matter to pass the uterine sound, that the difference of opinion exists. By some this condition is regarded as a very common and important source of trouble; by others it is held that a flexion causes no impediment whatever to the uterine canal. It appears to be evident that, while a naturally bent canal may be quite patent, any sharp bending of an originally straight or nearly straight canal of soft tissue, like that of the uterus, must tend to flatten it, and so diminish its calibre. The smaller the canal is originally, the more likely is such flattening to produce the effects of obstruction. Even when the canal is small as well as flattened, the obstruction, like that produced by extreme stenosis, need not necessarily produce dysmenorrhœa, provided that the menstrual flow is moderate and uniform in quantity, and perfectly fluid, but only does so when shreds of membrane or clots have to pass. The amount of obstruction cannot in any case be great, and would be easily overcome by uterine contraction, but might be sufficient to set up painful contractions in susceptible subjects. If the uterus is indurated in its flexed position the likelihood of some obstructive effect is greater.

The difference of opinion as to the frequency of anteflexion, apart from symptoms, may be in part accounted for by differences in the mode of estimating the anteflexion, or in the degree of curvature regarded as pathological. Statistics which have been given by different authors as to the frequency of association between anteflexion and dysmenorrhœa are very contradictory. Wedeler* found that of nulliparous women with dysmenorrhœa 37·3 per cent. had a well-marked anteflexion; while of nulliparous women without dysmenorrhœa 33·3 per cent. had a well-marked anteflexion. This would seem to show anteflexion to have an appreciable but not very marked place among causes of dysmenorrhœa. Herman,† from observations on nulliparous women suffering from contagious disease, concluded that it is practically as common for menstruation to be painless when the uterus is acutely anteflexed as when it is straight or only slightly anteflexed. These statistics are not altogether convincing, since the sound was not used to estimate the degree of anteflexion, or the impediment offered to its introduction; and among prostitutes and others suffering from contagious disease it might be expected that congestive dysmenorrhœa would so preponderate over obstructive that the latter would hardly show its effect in the statistics, and still less one only of several possible causes of obstructive dysmenorrhœa. Moreover, even in Herman's statistics, 30·1 per cent. of the women who had marked or acute anteflexion suffered from severe dysmenorrhœa, as compared with 27·9 per cent. of those whose uterus was nearly or quite straight. The very different way in which different authorities estimate anteflexion, especially when judged of only by bimanual examination, is shown by the fact that Boulard* found anteflexion in 100 per cent. of his cases of nulliparous women; Herman, anteflexion in 61·2 per cent., pronounced anteflexion in 47·7 per cent.; Depaul,† anteflexion in only 6·0 per cent.; Richet, in 18·0 per cent. These differences must be remembered in estimating the statistics. Of these observations, Boulard's were made at necropsies. My own experience would agree rather with the lowest estimate so far as regards marked and abnormal anteflexion. In any case, if it appears, even from the statistics of those who argue against anteflexion having any importance, that from 2 to 4 per cent. more of women having an anteflexed uterus than of women having a straight uterus suffer from severe dysmenorrhœa, this would seem in favour of the view that anteflexion really is among the causes of dysmenorrhœa. If as many women menstruate without pain when the uterus is acutely anteflexed as when it is straight or only slightly anteflexed, it may be explained on the ground that women only menstruate without pain when the menstrual flow is quite liquid, and that, in that case, neither anteflexion nor stenosis causes any dysmenorrhœa.

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* "Arch. f. Gynäk.," Bd. xxi.

† "Obstet. Trans.," vol. xxiii

Sterility appears to be more often associated with acute anteflexion than dysmenorrhœa, but it does not necessarily follow that it is due to the anteflexion. A primarily anteflexed uterus being often under-developed, the sterility may be due to imperfect development of the endometrium.

It is still the prevailing opinion that acute anteflexion is more frequently met with among women suffering from dysmenorrhœa, or dysmenorrhœa and sterility, than it is at post-mortem examinations amongst nulliparous women in general, and therefore that there is probably a causal relation between these conditions. It is true that theory does not receive the same confirmation by a therapeutic test, from the successful removal of symptoms by the cure of the anteflexion, as it does in the case of retroflexion from the successful results of treatment by Hodge's pessary. This may, however, be explained by the fact that it is impossible in anteflexion so effectually to straighten the uterus by any pessary except an intra-uterine stem, which, by the irritation of its presence, is apt to cause more evils than it can remove. It has been argued that flexions cannot produce any obstruction because the uterine cavity is not, post-mortem, found to be dilated. Such dilatation, however, is not to be expected. Just as, in stricture of the urethra, the bladder is found to be small, with thick walls, so in the case of the uterus, unless the obstruction is complete, the muscular walls become hypertrophied to overcome it, as is found to be the case in extreme stenosis of the cervix. The only post-mortem evidence, therefore, which obstruction of the canal would leave, is hypertrophy of the body of the uterus, and this is not infrequently found in cases of anteflexion associated with dysmenorrhœa. An anteflexed uterus, if examined soon after puberty, is usually found to be small, and the anteflexion is probably often part of a general want of full development. But, in later years, the cavity even of a nulliparous anteflexed uterus is not infrequently found to be elongated, the sound passing half an inch or more beyond the normal length, and the uterine walls appear to be thickened on bimanual examination.

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* "Gaz. des Hôpitaux," 1853, page 464.

† "Bulletin de l'Académie de Médecine," 1854-3, p. 640.

If anteflexion causes any impediment to the canal, it will tend to maintain any endometritis arising from other causes, owing to the uterine cavity not draining so freely. In marked anteflexion gravity is against the escape of secretion from the fundus in the upright position, but this must be remedied to a great extent when the bladder is full, and the reverse is the case in the dorsal position. Anteflexion would not therefore, from this point of view, even when extreme, tend to maintain endometritis so much as extreme retroflexion, in which gravity is against the escape of secretion both in the upright and dorsal positions.

There is no sufficient ground for holding that anteflexion interferes with the vascular supply of the uterus, except just where the tissue is compressed at the angle of a localized and acute bend; for there is nothing here corresponding to the pressure on the vessels where they are bent over the utero-sacral ligaments in extreme retroflexion. In cases in which the flexion is much more acute near the internal os than at other parts, it is often found that the uterine wall is thinner from atrophy on the concave side of the curve, and this naturally renders it difficult or impossible to remedy the anteflexion, except by an operation which has been advocated in America, namely *cuneo-hysterectomy*, or cutting a transverse wedge out of the convex side of the uterus, after abdominal section.

The general conclusion is that anteflexion, especially primary anteflexion, frequently exists without any symptom, and that the importance of this condition has been much exaggerated by some authors, but that an acute anteflexion, especially if acquired, may diminish the calibre of the canal, and so tend to produce, or assist in producing, dysmenorrhœa, and probably also sterility. Practically, an acquired cannot always be distinguished from a primary anteflexion, but, if the flexion is found to be specially acute at one point, it is more likely to be acquired. If a uterus have a primary anteflexion, and the flexion be afterwards much increased, it is obvious that there may be the same tendency to flattening of the canal as in the case of a uterus originally nearly straight.

Diagnosis.—The direction of the os and cervix is readily discovered by vaginal touch. In cervical anteflexion, a considerable length of the cervix may sometimes be traced behind the os, and the use of the sound may be necessary to distinguish between cervical anteflexion and partial retroversion. In corporeal anteflexion the fundus is felt resting low upon the anterior vaginal wall, and may be defined on bimanual examination as described in the case of anteversion. It is found to move in conjunction with the cervix, and a concavity or angle is felt between the two. If an attempt be made to pass the sound, it is generally arrested near the internal os, and can only be carried on to the fundus either by pressing the handle far back toward the perineum, by pushing up the fundus with the finger in the vagina, or by withdrawing the instrument and reintroducing it with an increased curve. The slighter degrees of corporeal anteflexion may be difficult to detect, especially in virgins when the vaginal walls are tense, and the exact curve of the uterine axis can then only be determined by means of the sound. The conditions chiefly to be distinguished from anteflexion are a fibroid in the anterior uterine wall, thickenings due to cellulitic or peritoneal inflammation, or to blood effusion, or tumours, or calculi in the bladder. All of these conditions, except calculus, are diagnosed by their fixity and ill-defined outline, but the most perfect evidence is that derived from the sound, especially in distinguishing the case of a fibroid in the anterior uterine wall. If the swelling felt anteriorly disappears when the uterus is straightened by the sound, or turned into a position of slight retroflexion, it is proved to have consisted of the fundus alone.

Treatment.—Treatment is, of course, only necessary when symptoms exist which are referable to the anteflexion. Reduction of the flexion is generally easy, but does not have a permanent effect. In the case of corporeal anteflexion, when the body of the uterus is bulky and soft, as in acquired flexions, it may sometimes be replaced with the fingers alone, by pushing up the fundus from the vagina, and then pressing it backwards by the outside hand above the pubes. Generally the sound is necessary for replacement, but it should not be employed if there is any sign of peri-uterine inflammation or acute hyperæmia. If it can only be passed with an extra curve, it is withdrawn, and introduced a second or third time, till it can be passed with its intra-uterine portion nearly straight. If undue softness of the uterus appears to be the result of malnutrition, it is important to see that a sufficiently nutritious diet is taken, and to adopt a generally tonic treatment.

It is usually impossible to straighten an anteflexed uterus by the use of any vaginal pessary. Since, therefore, the most important mechanical effect, if any, of anteflexion is that of causing an impediment in the cervical canal, and anteflexion is often associated with a canal rather smaller than the average, it is generally desirable, especially in anteflexion of the nulliparous uterus, when the flexion is thought to be an element in the production of dysmenorrhœa or sterility, to dilate the uterine canal to somewhat above its average calibre, rather than to insert any pessary. Dilatation may be effected by metallic bougies, by the occasional use of a tent, or by the use of Hegar's or other dilators under an anæsthetic, if repeated manipulation be considered undesirable (*see* p. 135). This treatment tends at the same time to straighten the canal temporarily in some measure; and it may not return to the same degree of anteflexion, if that has been extreme. In the great majority of cases of corporeal anteflexion, according to the author's experience, no further direct mechanical treatment than this is found beneficial.

In pure cervical anteflexion, pessaries are useless. In minor degrees, dilatation of the os and cervix may be sufficient. In higher degrees, when symptoms are present, such as those of obstructive dysmenorrhœa, and when the os is also small, it may be desirable, if dilatation has only a temporary effect, to incise the cervix backward, so as to convert the os into an elongated opening, more nearly in a line with the upper part of the cervical canal (*see* Fig. 95, p. 141). The mode of making the incision and the after-treatment are described under the head of Stenosis of the External Os (pp. 139-143). For cases in which the fundus is flexed forwards as well as the cervix, Marion Sims recommended the incision of the anterior uterine wall near the internal os in addition to that of the posterior wall of the cervix. It is impossible, however, when there is considerable corporeal flexion, to straighten in this way the cervical canal without a dangerously deep incision. Such an incision, moreover, generally tends to close again.

The most effectual means of straightening an anteflexed uterus, however, is one which has been the subject of much controversy, namely, the use of intra-uterine stem pessaries. While some distinguished authors have denounced them entirely, others have expressed apparently over-sanguine views of their efficacy. But, while the advocates of this treatment have described its results as brilliant, none of them has ever adopted the only method which, in such a doubtful matter, could establish it on a satisfactory basis—that is, to give a complete record of the results of every one of a series of consecutive cases. The objection to stem pessaries is, not that they are mechanically ineffectual, but that they always excite a certain degree of irritation and hyperplasia, while they have not infrequently produced severe and even fatal metritis and peritonitis. It might be inferred *à priori* that a mucous surface covered by a cylindrical epithelium is not likely to tolerate pressure and friction altogether with impunity, and this conclusion is confirmed by experience. Even with the most modern form of stems, and in the practice of careful physicians, fatal results after the use of these pessaries have been recorded. It is comparatively common to find that pain, or a rise of temperature, necessitates the removal of a stem before it has been long retained. Special precautions are therefore required in applying stems, and they should be used, if used at all, not as permanent supports, but as a temporary treatment, to be continued for a limited number of weeks or months, while a patient is kept under strict observation. It is generally advised that a stem pessary should be a little shorter than the uterine cavity; that it should be removed during the menstrual period; and that, unless the patient has immediate access to her medical attendant, a thread should be attached to the stem, by which she can withdraw it in case of any unpleasant symptom arising. No one should venture on the use of an intra-uterine stem who has not complete confidence both in his own power to judge of the suitability of the case, and also in the implicit obedience of his patient to directions. Their use is not to be recommended to those who have not given special study to the diseases peculiar to women. The varieties of intra-uterine stem which have been invented will not therefore be here discussed.

While I do not advise stem pessaries, I have met with patients who are not happy unless wearing them, and who declare that their introduction immediately relieves vesical tenesmus. The stem used has been a thin Greenhalgh's stem pessary of vulcanite, which is hollow and pierced with holes for the escape of secretions.

INVERSION OF THE UTERUS.

Pathological Anatomy.—Inversion of the uterus may exist in three stages: the first, when the fundus is only partially invaginated and remains within the os; the second, when the fundus has passed through the os; the third, a stage very rarely attained, in which the whole of the cervix as well as the body is completely inverted, so that not even a groove remains between the inverted cervix and the vaginal vault. Fig. 183 shows the first stage of inversion commencing. Either of the two latter stages may be complicated by extrusion of the inverted fundus outside the vulva. Acute inversion of the uterus belongs rather to midwifery, since it is generally the result of parturition. We have here to deal with the chronic stage, which may be regarded as reached, in cases occurring after delivery, when the process of involution is complete.

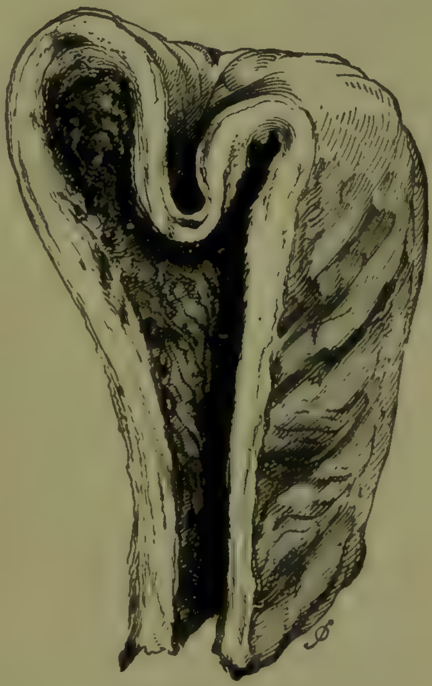
Fig. 183.
Commencing Inversion of Uterus.

Causation.—The conditions necessary for the production of inversion are laxity of the uterine wall, and a force of traction or pressure applied to some part of the fundus. In the puerperal state, the force is generally that of traction applied through the funis to an attached placenta, pressure by the external hand on a relaxed uterus, or simply the weight of the relaxed and prominent placental site, with or without the placenta itself in addition. Apart from parturition, it chiefly arises through the traction of a submucous fibroid, or fibroid polypus—generally the former, since, in the case of a polypus, less force is usually required to elongate the pedicle till the polypus descends through the external os, than to invert the uterus. In either case the uterus, grasping the invaginated portion as a foreign body, is stimulated to contract, and so increase the inversion.

Results and Symptoms. — The immediate symptoms of puerperal inversion are usually severe shock and collapse, frequently accompanied by sudden and severe hæmorrhage. The uterus is felt like a foreign body in the vagina or outside the vulva, and excites expulsive efforts. Inversion due to the traction of a tumour is generally established more gradually, and does not cause such violent shock or hæmorrhage. In the chronic stage, menorrhagia or irregular hæmorrhage is usually a prominent symptom, and often calls imperatively for relief, the patient generally becoming extremely anæmic from loss of blood. The presence of the tumour gives rise to bearing down, with rectal and vesical tenesmus, and frequently it becomes difficult or impossible to retain it within the vagina. The uterine mucous membrane becomes inflamed from the irritation to which it is exposed in its unnatural situation, and thus arises muco-purulent leucorrhœa. If the tumour be protruded externally, ulceration is likely to be produced, and even sloughing may occur. Death may result from sloughing, from hæmorrhage, or from gradual exhaustion. In some cases, adhesion arises between the peritoneal surfaces of the uterus, but this is very rarely found, even when the difficulty of reduction has been extreme. Inversion may sometimes persist for years with but slight symptoms, but this is usually found only in those instances in which, after the menopause, toleration has become established, and the structure of the uterine mucous membrane has been profoundly altered. I have known symptoms to remain entirely in abeyance during the lactation which followed the delivery at which the inversion was produced, but severe metrorrhagia commence as soon as the child was weaned. It is the rule for symptoms to become much more severe as soon as menstruation recurs. In very rare cases, spontaneous replacement has occurred, even after a long interval; and it is not uncommon to find reduction spontaneously completed after it has been commenced by art. The mortality of inversion of the uterus is considerable, and is estimated at from 26 to 35 per cent.; but of 109 fatal cases, collected by Crosse, 72 died within a few hours, the majority within half an hour, from shock and hæmorrhage, 8 died in from one to seven days, 6 in from one to four weeks, and 23 in the chronic stage. Out of 104 chronic inversions collected by Crampton,* 91 were cured, 7 died, and 6 remained unrelieved.

Diagnosis.—The tumour formed by the inverted uterus will be found externally, or felt by the finger in the vagina. The most essential point in diagnosis is to distinguish between inversion of the uterus and polypus, as well as to discriminate the case in which a polypus or fibroid tumour has produced by traction a partial inversion. In the case of polypus, the fundus may be made out on bimanual examination, the finger being introduced into either vagina or rectum, while in inversion it is absent from its normal place. The readiest mode of distinction is the use of the sound, which in inversion is arrested at less than the normal length, when passed up between the base of the tumour and the os, but in the case of polypus passes to the full length, or generally to a greater distance. In rare cases the surface of a polypus may become adherent to the edge of the os at all points, but the sound can almost always be forced through at some part, without excessive pressure. The surface of the inverted uterus, unless modified by long exposure, is highly injected, velvety, and readily bleeds. The orifices of the uterine glands may be visible, especially if examined with a lens. The uterus is also distinguished from a polypus by being painful, and sensitive to acupuncture, or the tightening of a ligature or écraseur wire. A crucial test is to pass a female sound into the bladder with the point directed backward. If a finger be introduced into the rectum, the point of the sound can then, in the case of inversion, be felt above the os, with only the walls of rectum and bladder intervening, at the point which would otherwise be occupied by the body of the uterus, and just above the point of junction of the diverging utero-sacral ligaments, which can readily be felt from the rectum. In some cases the funnel-shaped depression formed by the inversion can be felt from the rectum. Sometimes it may even be felt through the abdominal wall, if this is not too thick, especially in recent cases, following delivery, when the uterus is not yet involuted.

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* "Amer. Journ. of Obstet.," Oct., 1885.

If evidence of inverted uterus is found, and the origin of it cannot be traced to any delivery, there is a strong presumption that there is a tumour present, as well as the fundus uteri, causing the inversion. The use of the sound will show how much of the uterus remains uninverted. An estimate can then be formed how much of the mass protruding through the os is likely to belong to the uterus itself, allowing for the fact that there is likely to be hyperplasia of the fundus owing to the venous congestion. Some line of demarcation can also generally be found, indicating the boundary between the fundus and the tumour.

Treatment.—In recent cases arising from labour, reduction may be effected by taxis. The patient should be placed under an anæsthetic, the placenta having been peeled off, if not already detached, and the hand passed into the vagina, so as to compress the tumour and make steady and prolonged pressure upwards in the direction of the pelvic axis, while the other hand makes counter-pressure upon the abdomen. The effort should be to return first the part last inverted, not to indent the fundus, the effect of which would be to double the thickness of uterine wall to be passed through the constriction. If the inversion is chronic, there is considerable risk of producing laceration by attempting to reduce it immediately by forcible taxis, and it is preferable to commence by the method of prolonged elastic pressure. This will almost always be the case in inversions produced by the traction of a tumour. Even in recent cases following parturition, elastic pressure is preferable to forcible taxis as soon as the internal os uteri has contracted considerably, which will generally be the case after the first day or two. Under such circumstances, however, an extra-sized cup will be required

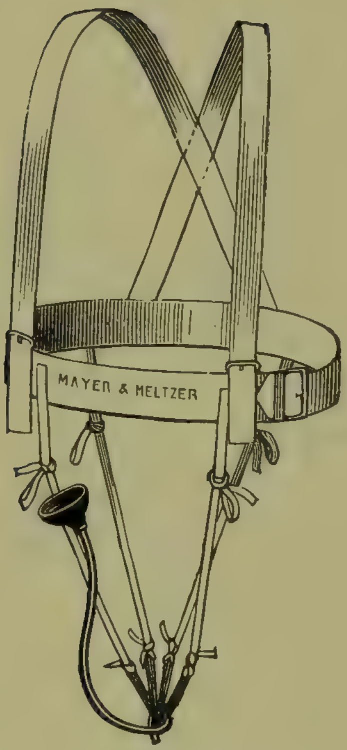

Fig. 184.
Aveling's Repositor for Inversion of Uterus.

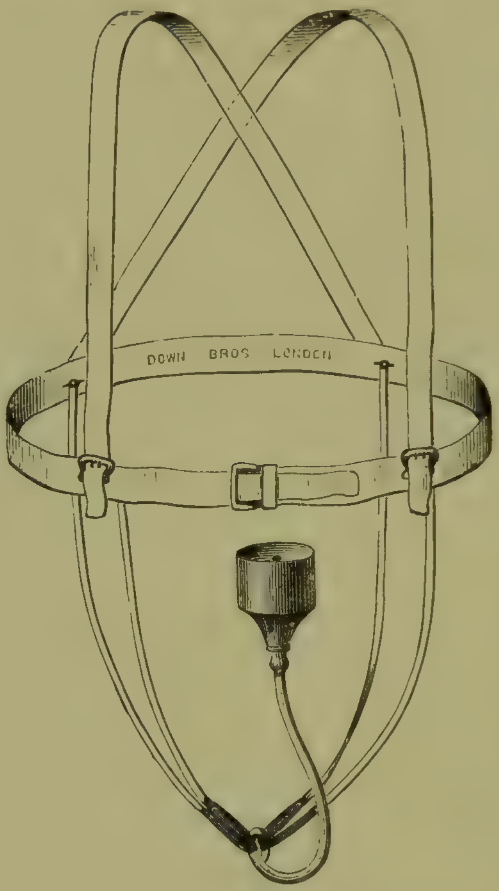

Fig. 185.
The Author's Modification of Aveling's Repositor.

suitable to the size of the fundus. The best repositor is that of Dr. Aveling (Fig. 184), the stem of which has a compensating perineal as well as a pelvic curve, so that pressure can be made accurately in the axis of the uterus, even when that organ is pushed up to the level of the pelvic brim.

The repositor should be fitted with at least two vulcanite terminals of different sizes, to be screwed on to its upper extremity: first, a cup-shaped disc large enough to receive the inverted fundus, for use in the earlier stage of reduction; secondly, a smaller cup, which may pass through the os, when the fundus has been once reduced inside it, and so complete the restoration. I have had the instrument modified by making the smaller terminal in the form of a cylinder cupped at the end (Figs. 185, 186), since the disc mounted on a small stem is apt, when reduction is complete, to be retained within the internal os, and to cause some difficulty in removal. One improvement on the instrument as commonly sold is readily carried out, namely, to perforate the small cup with holes. If this is not done, the difficulty of withdrawing the instrument, after the inversion is reduced, is increased by the pressure of the air. To the lower end of the repositor are fixed four elastic bands, to be attached

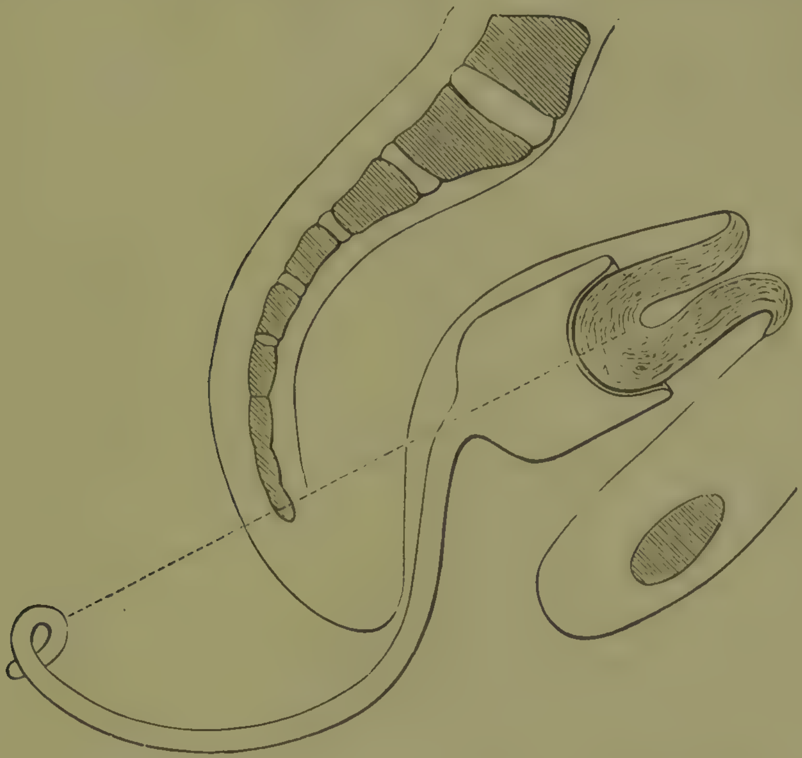

Fig. 186.
Modified AVELING'S Repositor for Inversion of Uterus, adjusted.

before and behind to a waist-belt supported by braces passing over the shoulders (Fig. 185, p. 352). By the adjustment of these the direction and force of pressure may be regulated. The patient should remain in bed, and morphia injections should be given, if necessary, to enable the pressure to be tolerated. Every few hours, the bands should be loosened, in order to observe the progress made. As soon as the fundus is reduced to the level of the external os, the large cup should be replaced by the small one. I have not yet found this repositor fail to effect reduction within from twenty-four to forty-eight hours, even when the inversion was of several years' standing, although in several cases ineffectual attempts had been made with it previously. Reposition may fail if the small cup is not small enough to pass through the external os uteri after the inverted fundus has been pushed back to the level of the vagina. If the repositor is removed before the reposition is absolutely complete, the inversion is gradually reproduced. In one case, attempting the reposition while the uterus was still large, I found that the largest cup slipped aside, owing to the fundus being too large for it. An extra large cup was constructed, and the inversion was then quickly reduced. In some cases there were slight symptoms of shock, immediately after the fundus had returned, as if there were some rupture of adhesions or internal bleeding, but no harm followed.

The following expedients have been adopted to meet difficulties which may occur at various stages of the reduction, but are not likely to be wanted if Aveling's repositor be used. Marion Sims and Barnes have recommended making two longitudinal incisions through the muscular fibres under the mucous membrane before applying taxis. When the reduction has been more than half completed, but the actual fundus resists restoration, Noeggerath has recommended that taxis should be made by pressure with one finger upon one horn of the uterus, about the point of exit of the Fallopian tube.

If the inversion is due to a fibroid polypus, the polypus should first be removed by the écraseur or scissors. If it is due to a sub-mucous fibroid, it will generally be possible to find the line of demarcation between the tumour and the inverted fundus. The fibroid may then be removed by enucleation. An incision is made round the border of the fibroid through the mucous membrane and capsule, and the tumour separated from the uterine wall by fingers or blunt instrument. The inversion is afterwards reduced by Aveling's repositor in the usual way.

Various operations have been performed after failure of attempts to reduce the inversion. Thomas, of New York, first performed abdominal section, dilated the internal os from above by an expanding dilator, and then returned the uterus by taxis. The best instrument for this purpose would be Bossi's four-bladed dilator, invented for dilatation of the cervix of the pregnant uterus. In the absence of this, Goodell's dilator (Fig. 50, p. 61) might be used.

Kehrer and Hirst have cut through the uterine wall either on its anterior or posterior surface, introduced a dilator through the opening into the peritoneal cavity, dilated the internal os, and then stitched up the wound with chromic catgut, and reduced the uterus by taxis. Some recent operators have performed abdominal section, incised the constriction from the peritoneal side, until the uterus could be reduced by taxis, and afterwards stitched up the incision. This plan would probably require incision through nearly, if not quite, the whole thickness of the uterine wall.

Amputation of the uterus was often performed before the invention of Aveling's repositor, and was generally carried out by the galvanic écraseur. It should now only be undertaken in very chronic cases in which the patient has passed the menopause; or in cases in which the inverted fundus has become gangrenous, and the patient is suffering from sepsis. Probably the safest method is to perform vaginal hysterectomy as described in Chapter IX. After division of the utero-sacral ligaments, the upper halves of the broad ligaments will come easily into reach, to be tied or clamped, on the fundus being drawn down. In cases of complete or nearly complete inversion, it would be possible to cut through the cervix, removing only the body with the upper portion of the cervix, and this plan would be more likely to allow the ovaries to be left than vaginal hysterectomy. The neck of the tumour should be secured by passing two strong ligatures through its centre as high up as possible. The cervix should then be cut through, the uterine and ovarian vessels secured on the peritoneal side of the uterine wall, and the peritoneum stitched together.

CHAPTER IX.

NEW GROWTHS OF THE UTERUS.

MUCOUS AND GLANDULAR POLYPI OF THE UTERUS.

Causation.—Just as, in cervical endometritis, a single mucous gland, when its orifice has become closed, readily elevates the loose mucous membrane, and becomes a minute projection or Nabothian gland, so the same process may be exaggerated. A fold of mucous membrane containing one or more glands may take part in it, while hyperplasia of the stroma of the mucous membrane takes place, and in this way a *mucous polypus* is formed. The same process may also occur in the glands of the body of the uterus, or those near the edge of the os, or on the outside of the cervix.

Pathological Anatomy.—The ordinary mucous polypi generally vary from the size of a pin's head up to that of a hazelnut, rarely exceeding the latter dimension. They are made up of one or several mucous follicles, with a stroma of soft and delicate connective tissue containing many nuclei, the stroma predominating over the glandular portion. The term "hypertrophic polypus" has been applied to a polypoid projection formed by hypertrophy of the tissue of the cervix intervening between two lacerations. These consist of connective tissue containing muscular fibres, but no large proportion of glands.

The stroma of a mucous polypus is often highly myxomatous. The gland cavity or cavities may be occluded, and distended with thick tenacious mucus. Mucous polypi generally grow from the cervical canal, and the pedicle then tends to become elongated, until the polypus appears outside the cervix. Sometimes they grow within the cavity of the uterus, and then generally do not reach the cervix. Polypi of this variety are often found unexpectedly at autopsies. They are often larger than mucous polypi of the cervix, but do not usually contain such large dilated gland cavities, though adenomatous tissue may make up a large proportion of their substance

Mucous polypi are covered by a thin and very vascular mucous membrane, and are generally bright or deep red in colour. The surface is covered with regular cylindrical epithelium. This, however, may be converted into squamous epithelium by exposure or friction, if the polypus protrudes outside the cervix.

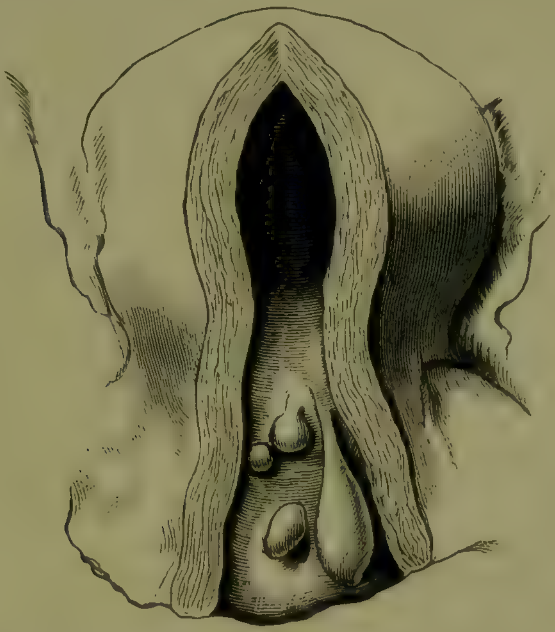

Fig. 187.—Mucous Polypi within Cervical Canal.

A case has been reported by Sir John Williams* of squamous epithelioma originating at the lower end of a mucous polypus of the cervix thus converted. Mucous polypi are often associated with the so-called "granular inflammation," or diffuse adenomatous hypertrophy, of the surrounding mucous membrane. Whether they grow from the cervix or body of the uterus they are often multiple, and, after the removal of one, others are apt to grow in the same individual (*see* Fig. 187).

When the proliferation of the gland-follicles predominates over that of the cellular tissue, "*glandular or adenomatous polypi*" are formed. These are of two kinds:—(1) The "*cystic*

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* "Cancer of the Uterus," p. 72; Harveian Lectures, 1886.

polypus," formed by dilatation of a single follicle. This generally grows from the cervical canal, and is sessile, or nearly so, not larger than a cherry, and very fragile, being filled with mucoid fluid. (2) The "*channelled polypus*." This is generally attached at the lower part of the cervical canal, or outer part of the cervix. It contains large irregular cavities communicating with each other, and opening on the surface, often by rather large mouths. These are lined by cylindrical epithelium, and contain mucoid fluid. In other cases the cavities have no outlet, and then the retained mucus forms a larger proportion of the bulk of the polypus. The surface may be covered by cylindrical epithelium, or by squamous epithelium, if the growth has sprung from the outer part of the cervix, or again partly by squamous and partly by cylindrical epithelium, when the polypus has been long exposed to the vagina. These polypi grow to a larger size than mucous polypi, and may attain a diameter of two inches or more. They correspond to the "follicular hypertrophy of the cervix" of Schroeder. If they reach or pass through the vulva they are apt to become ulcerated on the surface. The stalk may be of some length, and contain vessels which bleed much more freely on division than those of a fibroid polypus. In some cases a proliferating papillomatous growth springs up in the cavities, the tumour thus showing an approximation toward the malignant type.

Results and Symptoms.—Small mucous polypi may exist without any obvious symptoms, but more generally they produce leucorrhœa, and sometimes menorrhagia or metrorrhagia, with occasionally dysmenorrhœa and other symptoms dependent upon hyperæmia. The hæmorrhage is sometimes altogether out of proportion to the size of the polypus. It is due not so much to bleeding from the surface of the polypus as to hyperæmia set up by the irritation of its presence. In the same way the polypus tends to keep up and increase that hyperplasia of the cervix with which it is often associated at its commencement. The symptoms are generally greater while the polypus is within the cervix than after it is extruded outside the os. As compared with fibroid polypi, hæmorrhage is comparatively rare as a symptom of mucous or glandular polypi, while leucorrhœa is more prominent. A continuous but slight hæmorrhage, however, not unfrequently results from a mucous or adenomatous polypus, whether of cervix or uterine cavity.

Diagnosis.—The smaller mucous polypi, after they have passed outside the os, may sometimes escape detection by the finger from their extreme softness, but are easily recognized by the speculum. Polypi high up in the cervix, or in the cavity of the uterus, are generally only discovered when the cervical canal has been dilated for exploration as to the cause of hæmorrhage.

Adenomatous polypi have to be distinguished from sarcomatous or myxomatous polypi, which occur oftener in children than in adults, and from polypoid outgrowths in carcinoma. Adenomatous polypi may also undergo malignant degeneration.

Treatment.—Small and soft mucous polypi may be seized with ovum forceps having a catch at the handle, and the forceps rotated till the polypus is twisted off. There is then rarely any bleeding of consequence. If there is, the base may be touched with a swab of cotton-wool dipped in strong carbolic acid or liquor ferri perchloridi fortior. Polypi of larger size are best removed by the écraseur —écraseur and wire both being of dimensions suitable to those of the polypus. This is preferable to cutting them off with scissors, since the hæmorrhage on cutting a mucous or glandular polypus is greater in proportion than that from a fibroid polypus. If the polypus is small, the loop is most easily adjusted by the aid of a speculum. After the removal of a large adenomatous polypus the patient should be kept in bed for a day or two. If intra-uterine mucous polypi are detected as the cause of hæmorrhage, and are not large enough to be ensnared by a small écraseur, they may be destroyed by the sharp steel curette (Fig. 122, p. 213), or, if necessary, by the application of nitric acid, as in the case of the villous prominences of fungoid endometritis.

ADENOMA OF UTERUS.

Sometimes the glandular proliferation, instead of forming an outgrowth, penetrates into the wall of the uterus. Such conditions should be looked upon with suspicion as regards their tendency to carcinoma, since glandular carcinoma commences in this way. Hubert Roberts* figures a uterus with one lip of the cervix converted into a large tumour which protrudes into the vagina. It is everywhere riddled with cysts, each cyst lined with a delicate layer of columnar epithelium resembling that of the glands of the cervix. This is a rare condition.

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* "Outlines of Gynæcological Pathology," p. 177.

The condition described as hypertrophic or fungoid endometritis (*see* p. 226) is sometimes called adenoma of the uterus. It is better, however, to call it adenomatous hypertrophy of the mucous membrane, since it seems to be more nearly allied to the hyperplastic stage of chronic inflammation than to localized tumour-formation. Also, adenoma of the fundus uteri, in the sense of a localized tumour, does occur, though it is very rare. I have removed by enucleation multiple encapsuled tumours which were thought at the first to be ordinary encapsuled fibroids. But they were found to yield a milky juice on scraping, and on microscopic examination they were found to have the structure of adenoma. Much fear was entertained of malignancy, but the tumours did not recur, though the uterus was not removed.

Malignant adenoma of the uterus may occur, generally in the body. In this the epithelium remains as a single layer, and does not invade the stroma, but the malignancy is shown by the excessive proliferation of the glands with little or no stroma, and by their invading the muscular wall. Even adenomatous tissue which looks apparently innocent in itself is open to suspicion if it penetrates deeply into the muscular wall.

Treatment.—In doubtful cases of adenoma of the cervix or fundus, the clinical course and the tendency to hæmorrhage will be important guides. But it will generally be safer to remove the uterus by hysterectomy. A limited and apparently innocent growth in the cervix may be excised by a plastic operation after the fashion described at p. 220.

PLACENTAL OR FIBRINOUS POLYPI.

This name is given to a mass of tissue which is not a true polypus, but consists of a piece of adherent placenta, with a more or less firm attachment to the wall of the fundus uteri. The placental tissue causes bleeding, and thus increases by the accretion of fibrin deposited on its surface. Evidence of proliferation of villi retained in the uterus has occasionally been found up to several months after the death of the embryo. But it is doubtful whether true growth ever occurs in a mass of placental tissue which has assumed the polypoid form. A fibrinous polypus has been recorded, apart from pregnancy, and due to some other cause of local bleeding from the uterine wall. A placental or fibrinous polypus is generally friable enough to be detached by the finger, and is thus distinguished from a true polypus. Its nature is easily verified on examination of a microscopic section. Chorionic villi are seen, mixed up with fibrin.

FIBROID TUMOURS OF THE UTERUS, OR MYOMATA.

Causation.—Fibroid tumours are among the commonest of uterine diseases. In most cases they date their origin to the period of active sexual life. Nothing certain is known as to their causation, but it depends in a measure upon hereditary predisposition, and they are specially frequent in the negro race. It may be presumed that all causes of hyperæmia of the uterus favour their growth, and that they may take as their starting-point any localized inflammation, the result of parturition, abortion, or any other cause. Dr. Emmet, however, gives statistics which tend to show that, taking into account the relative number of unmarried, sterile, and fertile women, unmarried women between the ages of thirty and forty are twice as liable to fibroids as the sterile or fertile; and also that fertile women are considerably less liable than the sterile. He considers that the perverted nutrition arises from superfluous nerve-force not expended in the natural way in the sexual relations and in pregnancy and parturition, so that even marriage without conception acts in some degree as a safeguard. Experience at any rate seems to show that fertile women rarely develop fibroid tumours of any considerable size during the child-bearing period, but are more likely to do so after child-bearing has ceased. If a fibroid has existed before the first pregnancy, it is not uncommon for it to diminish. It may even shrink so much as practically to disappear, but again become manifest, and cause symptoms, after child-bearing is over.

Fibroid tumours most frequently come under observation between the ages of thirty-five and forty-five. They are not uncommon between twenty-five and thirty-five; and Spencer collected forty-two cases recorded under the age of twenty-five, but not usually much under that age. There is no satisfactory evidence of their occurring before the age of puberty. According to Champneys' statistics from the post-mortem records of St. Bartholomew's Hospital for over thirty years, in 1,860 necropsies of women over thirty years of age, uterine fibroids of greater or less size were found in 7·5 per cent. Haultain estimates the proportion of fibroids diagnosed among gynæcological out-patients of all ages as about 8 per cent.; Herman, as about 3 per cent.

Pathological Anatomy.—A fibroid tumour, more accurately called a myoma or fibro-myoma, is composed of the constituents of the normal uterine tissue, involuntary muscular fibres and connective tissue, in varying proportions, but, for the most part, in the main of muscular fibres. It is analogous to the tumours which frequently enlarge the prostate in the male sex. In most cases the tumour consists of one or more rounded masses, separated from the uterine walls around it by a capsule of connective tissue; but occasionally the tissue of the tumour is completely continuous with that of the uterus, and this is especially the case with the softer and more rapidly-growing

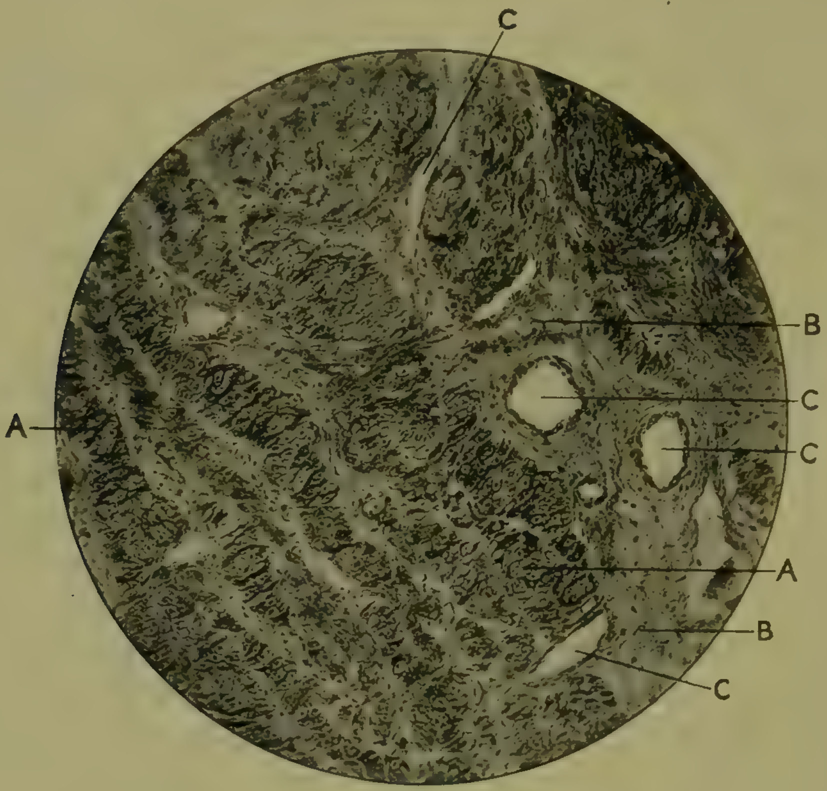

Fig. 188.—Section of Fibroid Tumour of Uterus.

A, Bundles of involuntary muscular fibre cut transversely or obliquely. B, Cellular tissue intervening between muscular bundles. C, Sections of vessels.

(Micro-photograph by Dr. E. S. Worrall.)

varieties. The muscular fibres are generally larger than in the unimpregnated uterus, but smaller than in the pregnant organ, and they are larger in the softer tumours than in the encapsuled variety. In Fig. 188 is shown the appearance of a fibroid tumour in microscopic section.

The encapsuled tumours are tough on section, their substance but slightly vascular, the cut surface white and glistening. The size of each mass usually varies from dimensions only discernible by the microscope, up to about the size of a foetal head. Vessels usually enter the fibroid only at the one point at which it is continuous with the uterine wall. The arteries are generally comparatively small, although occasionally they may be of large size. These encapsuled tumours are more frequently multiple than single, and twenty or more may be present in one uterus. Sometimes several simple fibroid masses are united together within a single capsule, and thus form a conglomerate fibroid tumour, with a lobular irregular surface. The individual masses then generally lose their spherical shape,

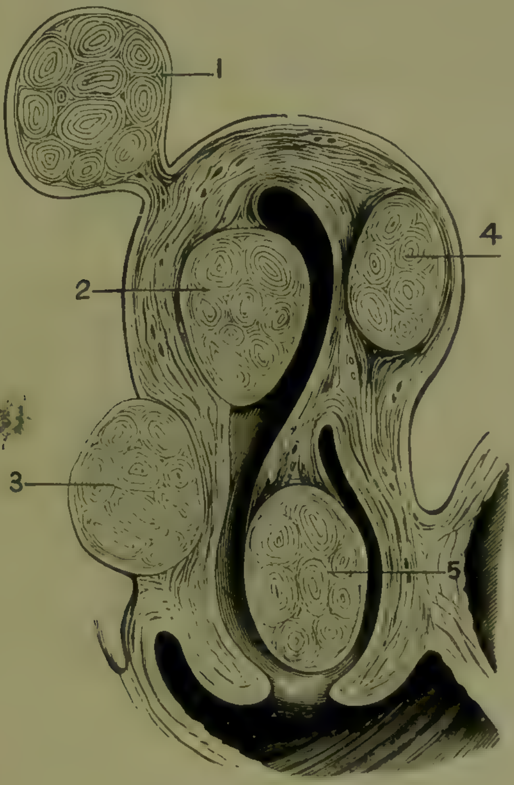

Fig. 189.
Varieties of Fibroid Tumour (Diagrammatic).

1, Sub-peritoneal, pedunculated; 2, Sub-mucous
3, Sub-peritoneal of cervix, non-pedunculated;
4, Interstitial; 5, Fibroid polypus.

and become distorted by pressure. A fibroid tumour of the uterus is recorded to have reached the size of 140 lbs., and to have weighed considerably more than the rest of the woman.

In the other and less common variety of fibroid tumour, which is not encapsuled, the tissue may be loose, and become œdematous by infiltration with serum, so that the whole is fluctuating and semi-fluid to the touch. Large collections of fluid may be formed by separation of the fibres, and in this way is constituted the *fibro-cystic* tumour. There is no cyst-wall, and the spaces are generally traversed by trabeculæ of cellular tissue. The encapsuled variety of fibroid tumours may also become œdematous, but less frequently.

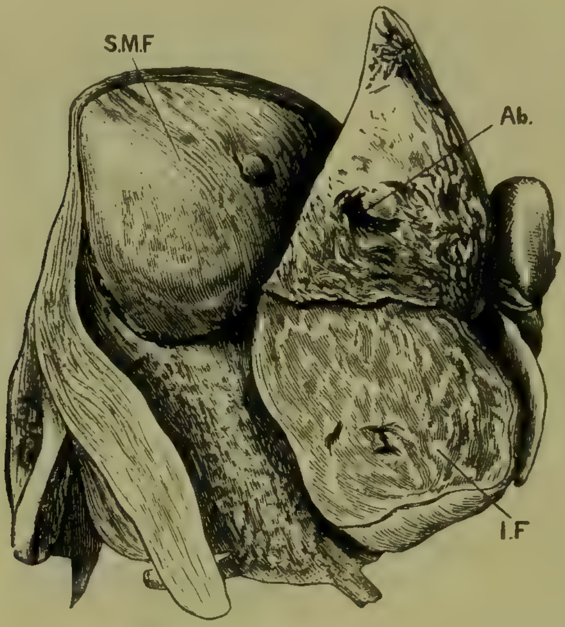

Fig. 190.—Fibroid Tumours of Uterus.

SMF, Sub-mucous; IF, Interstitial; AB, Abcess cavity in interstitial fibroid. The interstitial fibroid is laid open, and the halves separated.

Varieties.—The growth of a fibroid tumour commences in the substance of the uterine wall, but, by the effect of muscular contraction, it generally tends to be squeezed out, either towards the outside or the inside, according to the position of its starting-point. Hence, according to their position, there are four varieties of fibroids, which are called *sub-peritoneal* or *sub-serous*, when projecting from the exterior of the uterus, whether pedunculated or not; *interstitial*, *intra-mural*, or *intra-parietal*, when in the substance of the uterine wall; *sub-mucous*, when they project internally; *fibroid polypi*, when they have become completely extruded on the internal surface, so as to be attached only by a pedicle (*see* Fig. 189, p. 363, and Fig. 190). In Fig. 191 is shown a large intra-mural fibroid of the fundus uteri, encapsuled, but single.

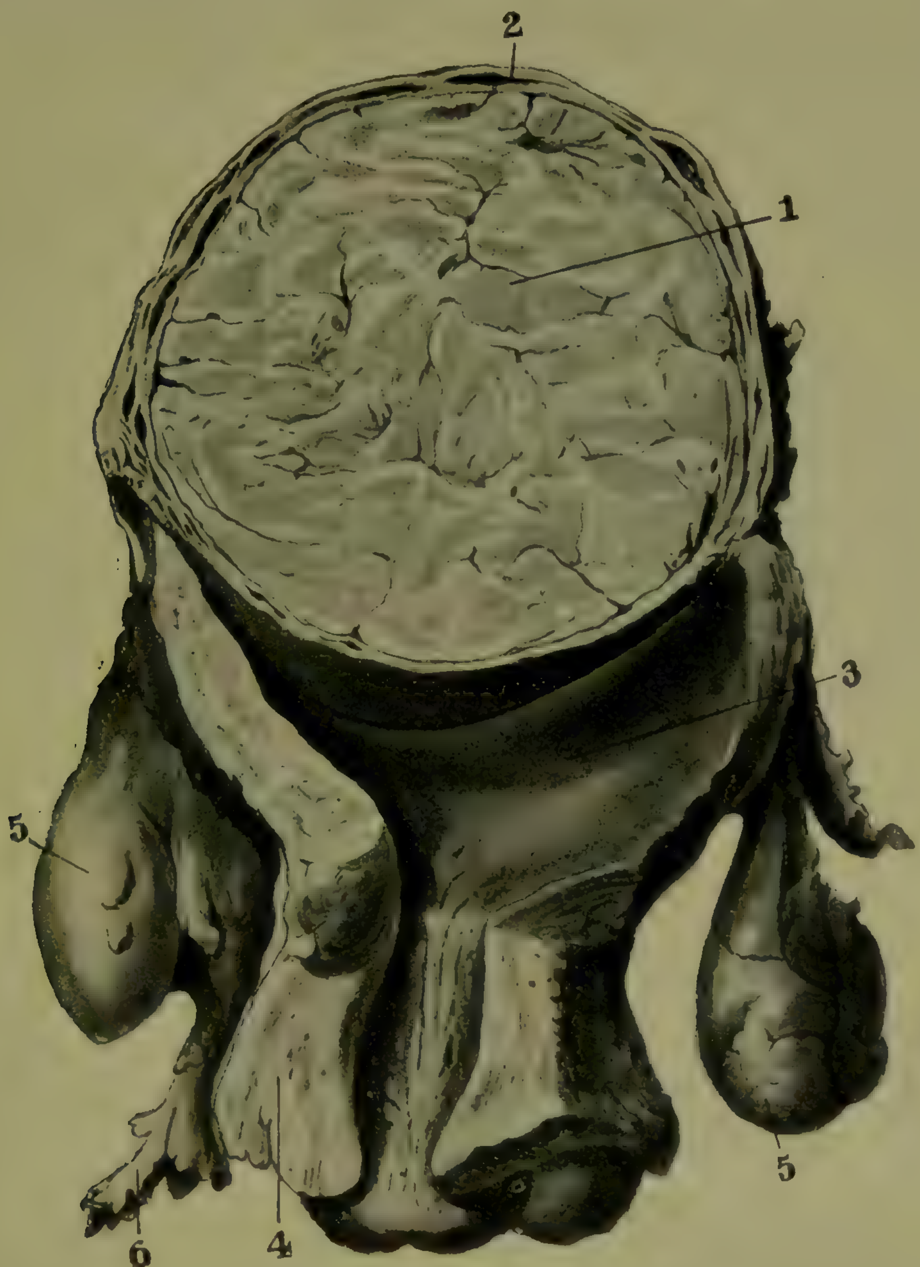

Fig. 191.—Uterine Fibroid (to show Capsule and the Ordinary Structure of such Tumours).

An intra-mural fibroid of the fundus uteri. The ordinary appearance of a fibroid on section is shown. The capsule is very well marked, and exhibits many large venous sinuses. The patient died of hæmorrhage due to the spontaneous opening of a uterine sinus at the lower part of the tumour.

1, Main mass of the fibroid. 2, Capsule showing a large venous sinus. 3, Cavity of uterus. 4, Cervix. 5, 5, Ovaries, which are enlarged and œdematous. 6, Fallopian tube.

(After Hubert Roberts. "Outlines of Gynæcological Pathology," Fig. 58.)

As a rule, the whole uterus becomes hypertrophied, and its cavity enlarged, but in sub-peritoneal fibroids this is sometimes not the case, and it may even become atrophied. The subperitoneal fibroid tumours, especially, are more frequently multiple, and one or more varieties of fibroids may co-exist. By sub-mucous or interstitial fibroids the uterine cavity is frequently much distorted. Small fibroids growing in the anterior wall of the fundus tend to produce anteflexion, those in the posterior wall retroflexion, of the organ. The posterior wall is the commoner seat. The softer varieties of fibroid tumour, especially when uterine hæmorrhage is a marked symptom, often undergo a manifest gradual increase of size before the onset of menstruation. This reaches its maximum shortly before the flow, or within the first day or two of its continuance, and the tumour then rather rapidly decreases again.

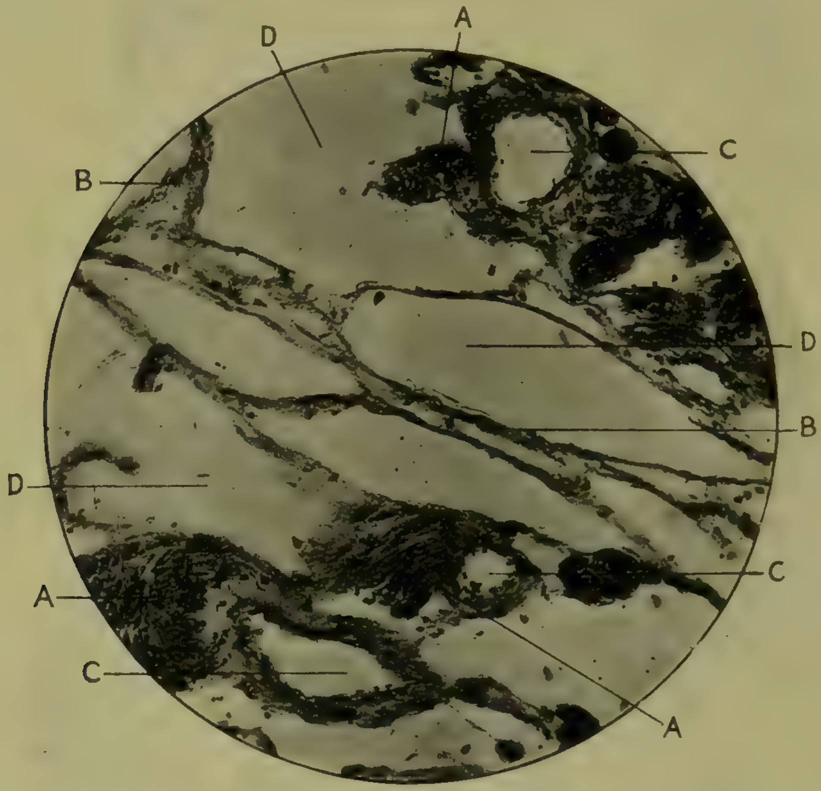

Fig. 192.—Section of Fibro-cystic Tumour of Uterus.

A. Muscular bundles. B, Separated bands of connective tissue. C, Sections of vessels. D, Cystic spaces formed by separation of tissue.

Fibroid tumours of the cervix are much less common than those of the fundus, and produce special effects owing to their position, which prevents their rising into the abdomen. They have the same varieties of position as fibroids of the fundus, but less frequently project internally, since the cavity of the cervix is not so large or so capable of growth as that of the fundus. They are commoner in the posterior wall than in the anterior. Most commonly they either enlarge the whole substance of the cervix or grow externally. In the latter case they grow to the greatest size, and do not become sub-peritoneal, but embedded in the cellular tissue, elevating the retro-uterine or ante-uterine pouch of peritoneum. They may fill up the whole pelvis, and even rise

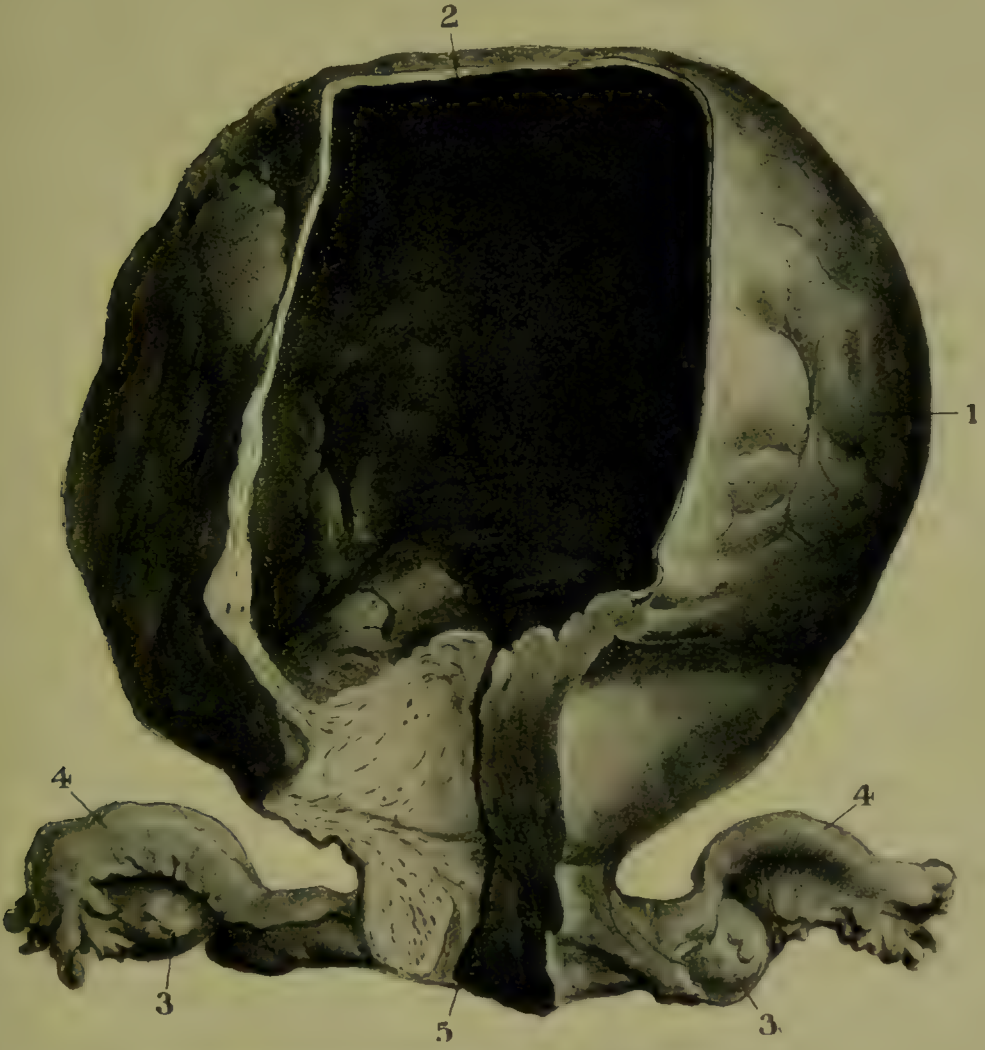

Fig. 193.—Fibro-cystic Tumour growing from Fundus Uteri.

Portion of a uterus and corresponding ovaries and tubes seen from the front. A large unilocular cystic tumour is attached to the fundus. The tumour is oval in outline, and measures eight inches by five inches; its wall consists of a thin layer of unstriped muscle and peritoneum. There is no lining membrane to the cavity, its interior being covered with shreds of blood-clot. Histologically it is a cystic fibro-myoma. It was removed from a single woman of forty-three.

1, Wall of fibroid, showing great thinning. 2, Cavity of the tumour. 3, 3, Ovaries. 4, 4, Fallopian tubes. 5, Cavity of uterus.

(After Hubert Roberts. "Outlines of Gynæcological Pathology," Fig. 63.)

into the abdomen, and have reached the size of 8 or 9 lbs. They are more often single, or consisting mainly of one mass, than fibroids of the fundus, and the normally small fundus uteri may generally be recognized, displaced upwards on the top of the tumour.

Besides the above-mentioned classification of fibroid tumours according to their position, another important division may be made into three classes, according to the nature of the growth. These are—(1) the encapsuled fibroid, which is usually hard, though it may become œdematous, and generally multiple; (2) the non-encapsuled fibroid, which is frequently soft and elastic, with fluid in its interstices, and which is generally also single, or else enlarges the whole uterus uniformly, though it may sometimes have irregular outgrowths when increasing rapidly; (3) the fibro-cystic tumour, which is a further development of the last variety.

In Fig. 192, p. 366, is shown a section of a fibro-cystic tumour of the uterus. It will be seen that spaces, without any epithelial lining, are formed by separation of the bands of connective tissue which unite the muscular bundles. In this way a large number of small cystic spaces may be produced, or one or more large cysts, which may occupy the main bulk of the tumour. Such a tumour containing one very large cystic cavity is shown in Fig. 193, p. 367.

On section a fibroid tumour is tough; the section appears but slightly vascular, and yields no milky juice on scraping. The capsule generally contains large vessels, and often enormously dilated veins. The uterine and ovarian vessels become greatly hypertrophied, especially the veins, and are often irregularly developed. The arterial supply of an encapsuled fibroid generally enters it perpendicularly from the capsule, and the main vessels are often limited to one spot, where the fibroid has its chief attachment to the rest of the uterus. In a diffuse non-encapsuled fibroid the growth itself is more vascular, and the vessels enter it in all directions. In general, the harder fibroids contain a larger proportion of fibrous tissue, the softer ones of muscular fibre. A special vascular variety of fibroid, of rare occurrence, has been described, called by Virchow "myoma telangiectodes," in which the tumour forms a soft spongy mass, containing cavities full of blood or soft thrombi. These cavities are said to be lined by endothelium. By rupture of these small cysts, larger cavities may be formed with irregular walls, also containing blood.

A fibroid polypus is initially covered with cylindrical epithelium. If it is extruded wholly or partially into the vagina, the most exposed part generally has its epithelium converted into squamous epithelium, but it may be denuded of epithelium by friction.

The broad ligaments may be separated by the bulging of a fibroid tumour into them, if a fibroid is extruded, or grows, externally on the lateral wall instead of on the anterior or posterior wall. The same thing may happen in some cases from great enlargement of the whole uterus, especially if the fibroids are growing mainly in its lower segment. In such case the round ligament and Fallopian tube, on one or both sides, are spread out upon the surface of the tumour. The ovary may also be flattened out upon the tumour, so that it cannot be safely removed without removal of the uterus. The ureters are often stretched upon the surface of the tumour, and may be considerably displaced. I have found a ureter distant five inches laterally from the cervix, and carried up above the pelvic brim. In rare cases the whole of the pelvic peritoneum may be stripped up and carried above the brim by a large tumour, so that a large part of the tumour becomes cellulitic in its relations. A special cause of deep burrowing into the broad ligament, while the tumour is still small, appears to be the existence of firm adhesions, the result of peritonitis, binding down the uterus and appendages, and existing previously to the growth of the fibroid. The tumour is thus unable to rise up easily toward the abdomen, and its spread is determined by the direction of least resistance.

Results and Symptoms.—The prominent symptom of those fibroids which enlarge the uterine cavity or project into it—that is to say, of the sub-mucous and of many of the interstitial variety—is menorrhagia. This depends partly upon the increased surface, and partly upon the active hyperæmia of the mucous membrane due to the stimulus of the growth, and the passive hyperæmia which may result from pressure. In some cases the hæmorrhage takes the form of metrorrhagia. The bleeding takes place, for the most part, from the general mucous membrane lining the enlarged uterine cavity, but that which covers the fibroid tumour takes part in it also.

Apart from the degree of menorrhagia which results from the enlargement of the uterine cavity, the tendency to bleeding is to a certain extent proportional to the projection of the tumour into the uterine cavity. Thus, in the case of a fibroid polypus, the bleeding almost always takes the character of metrorrhagia, continuous or irregular bleeding, rather than menorrhagia, and is often severe enough to produce extreme anæmia. In a sub-mucous fibroid, the bleeding is greater and is more likely to occur independently of menstruation, than in an interstitial fibroid. In the case of a sub-mucous fibroid, if metrorrhagia supervenes in addition to menorrhagia, it is often an indication that the tumour is becoming extruded more into the cavity of the uterus, or tending to become polypoid. As a general rule, however, unless the tumour is polypoid, the characteristic symptom of a fibroid tumour is menorrhagia rather than metrorrhagia. If, in the case of an old-standing fibroid, metrorrhagia comes on about or after the usual date of the menopause, it is necessary to look out for the possibility of cancer of the body of the uterus as a complication of the fibroid.

When there is no enlargement of the uterine cavity, as may be the case when there are only pedunculated sub-peritoneal fibroids, or when a fibroid, even of great size, grows upwards from the top of the fundus uteri, the tumour may cause no tendency to bleeding at all. In such cases, menstruation may be normal or even scanty. The menopause is not usually postponed so much as when the tumour enlarges the uterine cavity.

The same hyperæmia which leads to menorrhagia or metrorrhagia produces also leucorrhœa, and often congestive dysmenorrhœa. If the exit from the uterine cavity is obstructed, as it often is, by sub-mucous fibroids or fibroid polypi, obstructive dysmenorrhœa is likely also to result, and frequently endometritis from the irritation produced by retained clots or secretions. Adenomatous hypertrophy of the mucous membrane may result from the stimulus produced by the presence of the fibroid, and lead to leucorrhœa or metrorrhagia. Often there is atrophy of the mucous membrane on the summit of the tumour, or where it is exposed to pressure, and adenomatous hypertrophy at the sides or borders or in other parts of the uterine cavity. Dragging pain is generally produced by the increased weight of the uterus, and the frequently associated hyperæmia or endometritis. Sometimes severe spasmodic pain arises from the contractions of the uterus excited by the presence of the tumour.

The remaining symptoms of fibroid are those due to mechanical pressure, and these are frequently the sole symptoms of sub-peritoneal growths. Vesical and rectal tenesmus are common, and sometimes retention of urine or extreme constipation is produced by direct pressure. In some cases this happens only when the tumour swells at or just before menstrual periods. These symptoms are specially urgent when a fibroid growing from the posterior uterine wall is incarcerated in the pelvis, or when a fibroid of the cervix, or one which partially involves the cervix, becomes large enough to press upon the neck of the bladder. Sterility is a usual result, especially from sub-mucous fibroids, and if pregnancy occurs, there is great liability to miscarriage, and to hæmorrhage after delivery. A fibroid tumour in the pelvis may render delivery through the pelvis extremely difficult or impossible. Sub-peritoneal fibroids, however, of moderate size, if they do not obstruct the pelvis, are not inconsistent with natural pregnancy and delivery; and, when they are too small to cause appreciable pressure, frequently exist without symptoms of any kind.

Changes of size in fibroid tumours occur in relation to the menstrual cycle, especially in those which are soft or subject to œdema. The tumour increases during the period of growth of the endometrium, and reaches its maximum shortly before a period. Any pressure symptoms, such as retention of urine, occur first at this time. As soon as the flow commences, or sometimes a little earlier, the tumour begins to shrink, and reaches its minimum about the end of the period.

When the tumour grows to enormous size, as is more likely to occur in the softer and fibro-cystic varieties, the circulation, respiration, and other vital functions may be interfered with, as in large ovarian tumours. Large fibroid tumours generally remain for a long period free from adhesions. Peritonitis may, however, occur as a complication, and the tumour then becomes adherent to surrounding organs. It appears probable that the peritonitis generally arises in the same way as perimetritis in general; namely, through the medium of salpingitis and extension of inflammation from the tubal mucous membrane to the peritoneum. This may be merely a casual complication, but often the presence of the tumour will have promoted the endometritis which was the starting-point of inflammation. A fibroid in a state of sloughing or inflammation may directly cause inflammation of the peritoneum covering it, but such peritonitis, due to changes in the tumour, is very much rarer in uterine than in ovarian tumours.

Pathological Changes in Fibroid Tumours.—The vascular supply of encapsuled fibroids is apt to be interfered with by pressure as the tumours grow, and hence these tumours are very liable to degenerative changes. Effusion of fluid among the fibres associated with active growth occurs in diffuse fibroids, but degenerative œdema is more likely to occur in encapsuled fibroids. There is then a liquefactive change, either diffused or in limited spaces, the muscular fibres are swollen and disintegrated, and the connective tissue has often undergone myxomatous change. Yellow serum, which generally forms a spontaneous coagulum of fibrin, drains from the section.

A change more nearly approaching to necrosis has been termed necrobiosis. This generally occurs to an encapsuled fibroid. On section, while the capsule has its normal bright red colour, the tumour itself has an ashy-grey appearance, often with some liquefactive changes, and degeneration of fibres. It is said that microbes may be present in these cases; but they are not generally virulent, and there is no decomposition.

The ovaries are rarely normal in the case of large fibroid tumours. It is generally supposed that the changes found in them are secondary to the fibroids, rather than the cause of the development of the fibroids. In most cases the ovaries are enlarged, and appear swollen and œdematous. They may contain small cysts from degeneration of Graafian follicles, and the stroma is often myxomatous.

The Fallopian tubes are often greatly lengthened, and appear highly vascular, especially the fimbriæ. If peritonitis has occurred, there may be hydrosalpinx or pyosalpinx.

Inflammation of a fibroid tumour may be set up by traumatic causes, such as injuries, parturition, or attempted operation through the cervix. Suppuration or necrosis with decomposition implies infection by microbes. When the vitality of the tumour is lowered, it readily affords a nidus for their growth.

It appears that infection generally obtains access from the endometrium. But the fibroid shown in Fig. 190, p. 364, has a small abscess cavity in its centre, though there is no lesion on the internal surface. Thus the microbes can penetrate through a great depth of tissue, or be conveyed by the circulation till they find a suitable nidus.

Necrosis most often occurs in tumours which the uterus is beginning to expel in the direction of the vagina. Constriction of the base is thus caused, which interferes with the circulation, and the tumour is brought nearer to the sapric microbes of the vagina. A fibroid polypus large enough to be the subject of pressure generally becomes necrotic sooner or later. Necrosis is also very apt to spread throughout tumours upon which any operation has been performed from the vagina without their complete removal. It may be started by the use of strong caustics to the endometrium, or by burning the endometrium with an electrode. I have known it follow oophorectomy performed in the case of a large fibroid, apparently in consequence of the cutting off of the blood supply from the ovarian arteries.

When sloughing of a fibroid occurs, the patient runs great risk both from sapræmia and septicæmia; and the risk is greater the larger the area of attachment and the greater the circulation through the part of the tumour which has become infected.

If abscesses form within a fibroid tumour, they most frequently open into the uterine cavity. But infection may reach the outside of the tumour from adherent intestine, or by running along the Fallopian tube; and then abscesses may form near the exterior, and open into intestine, or into the peritoneal cavity, causing fatal peritonitis.

Hæmorrhage may occur into fibroids, either in the form of diffuse infiltration, probably the effect of obstruction to the circulation; or of localized hæmorrhage into a cavity, especially that of a fibro-cystic tumour. A sub-peritoneal fibroid may become detached from the uterus, and either remain free in the abdominal cavity without decomposition, or attach itself to some other organ. I have known a very large fibroid to obtain its nutrition from a large artery developed from an omental adhesion.

A fibroid tumour may distort the uterus extremely, and sometimes rotate it through 90° or even more. This rotation does not go to such an extent as to produce strangulation, as in the case of the twisting of the pedicle of an ovarian tumour. Rotation of the pedicle of a sub-peritoneal fibroid is probably one of the causes which may lead to its detachment.

Calcification of fibroids, from deposit of carbonate and phosphate of lime, sometimes occurs, especially in old women with long-standing fibroids, and in sub-peritoneal fibroids with a long pedicle and poor nutrition. Calcified fibroids have been found quite loose in the peritoneal cavity. The calcification may be limited to the surface or diffused throughout the whole tumour.

Malignant degeneration of fibroid tumours is described, but is rare as compared with invasion of the fibroids by carcinoma commencing in the endometrium of the fundus. The latter combination is so often observed that there seems to be reason to believe that the fibroids predispose to the carcinoma, probably by causing adenomatous hypertrophy of the endometrium. I have met with carcinoma of the endometrium limited to those parts of the mucous membrane which covered sub-mucous fibroids. Small fibroids of the fundus are not unfrequently found when the uterus is removed on account of cancer of the cervix. It is possible that the same individuals may have a susceptibility to the two diseases.

Cases have been described in which a supposed fibroid, known to have existed for many years in the uterus, takes on rapid growth, with metastatic deposits in various viscera; and in which, after death, a sarcomatous structure has been found, both in the original growth and the metastases.* These are very rare; but I have met with some instances in which a tumour, diagnosed as a fibroid, and supposed on naked-eye inspection after removal to be a diffuse, non-encapsuled fibroid, has proved, on microscopic section, to be a spindle-celled sarcoma, containing also many round cells and proliferating nuclei. In such cases, the patients have been comparatively young, and the tumour not of many years' standing. They are open to the interpretation that the tumour may have been sarcoma from the first. But the arrangement of their fibres, similar to that usual in a fibro-myoma, was suggestive of their having originated by malignant degeneration of such a growth.

It is not always easy to distinguish sarcomatous degeneration from inflammation of a fibroid. In one instance, a tumour, which had been removed by hysterectomy, and shown as a sarcoma, was carefully examined by histological experts, and pronounced to be an inflamed fibroid. But, before their report could be presented, the patient was found to be dying from metastases. Such a case is in favour of the view that sarcoma really does arise by degeneration of a fibroid, and that the tumour is not always malignant from the first.

In 100 cases of abdominal operation for fibroids of the uterus recorded by Cullingworth,† secondary changes in the tumour had occurred in 52. Of these, 27 were œdematous and myxomatous, 1 myxo-sarcomatous, 5 cystic or fibro-cystic, 1 calcareous, and 18 necrotic, divided into 15 necrobiotic and 3 infected.

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* See Doran., "Trans. Path. Soc.," vol. xli., p. 211.

† "Journ. of Obstet. and Gynæc.," Jan., 1902.

In 100 cases of operation recorded by Mrs. Scharlieb,* secondary changes of the tumour had occurred in 26. Of these 5 were œdematous and myxomatous, 6 sarcomatous, 7 cystic or fibrocystic, 2 calcareous, 2 necrotic and infected, 3 sloughing, 1 invaded by carcinoma, and there were 2 or 3 more associated with carcinoma. It will be noted that the proportion of sarcoma in these cases seems unusually large, and it is possible that sarcoma may often be overlooked, because a tumour whose naked-eye appearance is that of an ordinary fibroid is not always submitted to microscopic section.

The above proportion of degenerations does not, of course, apply to all fibroid tumours, but only to those considered to call for operation.

Natural Terminations.—In most cases the growth of a fibroid tumour is slow, so that even a very large tumour may be borne for many years without very serious result. The rapidity of growth varies much in different cases, but a tumour does not often grow to the size of a full term pregnancy in less than ten or twelve years. Fibro-cystic tumours may grow much more rapidly, and rapid increase may occur from œdema or hæmorrhage, sometimes followed by diminution. After the menopause growth is usually lessened or arrested, and, as a general rule, the tumour tends to diminish. There are numerous exceptions, however, to this rule, especially in the case of the large and soft non-encapsuled variety of fibroid, and in the fibro-cystic tumour, which may continue to grow unchecked after the menopause.

It is generally stated that the natural menopause, or removal of the ovaries, has no effect upon the growth of a fibro-cystic tumour. I have known, however, the cystic part of a fibrocystic tumour to disappear after the menopause, and the whole tumour to shrink in consequence, though it still remained of great size.

A large fibroid tumour tends to postpone the menopause, especially when associated with much menorrhagia. The average age at which it is established in such cases may be taken as being from fifty-three to fifty-five, instead of forty-eight. Not unfrequently the symptoms become increasingly troublesome as the menopause is approaching. After the menopause the symptoms are relieved in most cases, and sometimes the tumour, if not large, shrinks so much as practically to disappear. In very large tumours only a moderate diminution generally occurs.

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* "Journ. of Obstet. and Gynæc.," Oct., 1902.

Spontaneous disappearance of small or moderate fibroids has occasionally been observed, especially as the result of involution after delivery. Spontaneous cure may result from the sloughing and expulsion of a sub-mucous fibroid, if the patient survives the risk of septicæmia; or a fibroid polypus may slough away, or may be detached and expelled.

A fibroid tumour may lead to a fatal result through sloughing, followed by sapræmia or septicæmia, through septic infection and the formation of abscess, more rarely through peritonitis set up by changes in the tumour. Death from hæmorrhage has followed the rupture of a large venous sinus; but a fibroid rarely kills directly through hæmorrhage, though it often reduces a patient to extreme anæmia. This may predispose to other diseases which prove fatal. A common effect of the anæmia is venous thrombosis, which involves a risk of pulmonary embolism.

Fibroids of the cervix, or those incarcerated in the pelvis, are specially dangerous from the pressure effects. Sooner or later they cause retention of urine, then follows cystitis, and infection is liable to spread to the kidneys. More insidiously a fibroid tumour in the pelvis, especially if behind the uterus, may lead to disorganization of the kidneys by pressing upon the ureters and causing dilatation of the pelves of the kidneys. In rare cases a fibroid tumour may kill by its pressure effects simply from its enormous size, like a neglected ovarian tumour. This is more likely to happen in the case of a fibro-cystic tumour.

If a very large sub-mucous fibroid or fibroid polypus is expelled through the os uteri, and impacted in the vagina, death may result from the effects of pressure, or from sloughing and septic absorption. The result is aided by nerve exhaustion due to the efforts of the uterus to expel the tumour, and similar to that which occurs in obstructed labour.

Fibroid tumours frequently cause sterility; but, if pregnancy occurs, serious dangers may arise. If the fibroid is in the cervix, or occupies the lower segment of the uterus, it may form an obstacle to the passage of the fœtus, or the dilatation of the os, which renders delivery through the pelvis difficult or impossible. Fibroids of all kinds grow with the uterus during pregnancy, and become involuted with it afterwards. If of large size they may cause serious pressure symptoms with the addition of pregnancy. Even when situated in the upper part of the uterus they may interfere with uterine contraction during labour, and predispose to post-partum hæmorrhage after delivery. A fibroid may slough from injury received during parturition. On the other hand, when small or moderate fibroids are situated in the upper part of the uterus, pregnancy and parturition often go on with less interference than had been anticipated. Even fibroids from which obstruction to labour had been anticipated may rise above the brim toward full term, and give little or no trouble.

In the 141 cases of fibroid tumour which Champneys found recorded in 1,860 necropsies of women over thirty years of age, three deaths were attributable to the fibroids, apart from operation, or 2·1 per cent. This would probably give a death-rate higher than the average, since in the cases in which a fibroid tumour was threatening death, its presence would be a reason for admission to the hospital; while in the cases in which the patient died from some other disease it would not. On the other hand, the 141 cases would include many cases of small fibroids which would never have come under notice during life; and cases in which death followed operation appear to be excluded from the statistics. There are, in fact, no statistics available indicating the real mortality of fibroid tumours.

Diagnosis.—Sub-peritoneal fibroids of small or moderate size will reveal their outlines to bimanual examination, and will usually be recognized as attached to the uterus, and movable with it. If a fibroid is reached by vaginal touch, and is about equal in size to the normal uterus, the distinction between the fibroid and the uterus must be made by the sound. If a fibroid exist in the anterior or posterior wall, producing flexion, it will still be felt as a prominence after the uterus has been restored, or its curvature reversed, by means of the sound. If a fibroid is fixed by adhesion in the pelvis, the diagnosis is more difficult, since it may be impossible to make out its attachment to the uterus. From a small ovarian tumour it is usually distinguished by its hardness; from a swelling due to hæmatocele, peritonitis, or cellulitis, by its rounded and defined outline, connected with the uterus, and not merging gradually into surrounding parts.

If the enlargement of the uterus from the presence of a fibroid be externally uniform, the diagnosis from early pregnancy may usually be made by its greater hardness, generally less globular form, less variation of consistency, as well as by absence of softening in the cervix, and the association, not of amenorrhœa, but usually of menorrhagia. In early pregnancy there will often be Hegar's sign, discoverable on bimanual examination; that is to say, a relative softness of the middle portion of the uterus as compared with the firmness of the cervix and the upper part of the fundus. In molar pregnancy, or retention of a dead ovum, these distinctions may fail, and even the history be delusive; but the sound will generally reveal the presence of something in the uterus, and dilatation of the cervix will clear up any doubt.

From subinvolution and hyperplasia the diagnosis of fibroid tumour can sometimes be made only after dilatation of the cervix, the index finger being passed into the cavity of the uterus, when the localized character of the enlargement may be detected. When, however, the uterine cavity is lengthened to more than four inches, apart from pregnancy or procidentia, the existence of a fibroid is probable; and the diagnosis is confirmed if the sound shows the cavity to be distorted and displaced to one side of the centre of the uterine mass.

Large interstitial fibroid tumours are generally easily distinguished from solid ovarian tumours by the fact of the tumour forming one mass with the cervix, and moving with it, and by the great elongation of the cavity of the uterus. The distortion of the cavity, however, may render it impossible to pass the sound, while, in the case of ovarian tumours, the cavity of a uterus, closely connected to the tumour, may be lengthened to as much even as five inches. Large sub-peritoneal fibroids may often be distinguished by their multiple character, and hard, irregular, nodular outline. Even if the tumour be single, the presumption is in favour of its being uterine if it is solid and hard. The attachment of the tumour to the front or back of the uterus may often be made out, either *per vaginam* or *per rectum*, especially if the cervix be drawn downward, in conjunction with the bimanual examination (*see* p. 40). Uterine tumours also remain longer free from adhesion than do solid ovarian tumours.

In some long-standing and slowly growing fibroid tumours there is a minute nodulation of the surface, like small shot projecting, associated with stony hardness. It is due to the tumour being a conglomerate of minute fibroids arising from very numerous centres of growth. The nodulation is apt to be mistaken for a sign of malignancy, but is distinguished from that due to carcinoma by its being limited to the growth itself, and by the absence of adhesion. Such growths are generally not of great size.

Over a certain proportion, but only a minority, of fibroid tumours, a uterine souffle like that of pregnancy is heard. When this is detected, it appears to be positive proof that the tumour is not ovarian. Comparing fibroid tumours with pregnancy, the souffle is likely to be heard over a smaller tumour in pregnancy. If it is heard, therefore, over a mass whose size corresponds to three or four months' pregnancy, pregnancy is more probable than fibroid tumour, so far as this sign indicates. A marked change from time to time in the loudness and pitch of the souffle, caused by uterine contractions, is in favour of pregnancy rather than fibroid tumour.

In the case of a large fibroid of the cervix, extending up into the abdomen, the normally small fundus uteri can generally be felt as a knob on the top of the tumour.

Fibro-cystic, or soft fibroid, tumours are often very difficult to distinguish from ovarian, but are in general of much slower growth. If their growth enlarges the whole uterus, the sound will usually decide the point. If they are sub-peritoneal, the chief point of distinction is that the manifest fluctuation is generally limited to special regions, while the rest of the tumour is hard or only semi-fluctuating. If a puncture be made in doubtful cases, the character of the fluid will generally decide. In the case of a vascular tumour, however, the puncture might prove more dangerous than an exploratory incision. In fibro-cystic tumours the fluid is usually clear, limpid, and yellowish, deposits spontaneously a coagulum of fibrin, contains albumen but not paralbumen, and under the microscope shows leucocytes or spindle-cells, but not the granular cells of ovarian fluid. In some cases the fluid may be blood-stained or purulent. For the characters of ovarian fluid, *see* pp. 489, 500. In some cases it may be impossible to distinguish with certainty between a uterine and ovarian tumour, except by exploratory incision. If an incision is made, the dark red colour of a uterine tumour distinguishes it from an ovarian, which is paler, or has a bluish tint. It is to be remembered, however, that if a patient is very anæmic from hæmorrhage, a uterine tumour may be nearly as pale as an ovarian, though it never has the characteristic blue tint seen in many ovarian cysts.

Diagnosis of Fibroid Polypi.—Care should always be taken that an inverted uterus is not mistaken for a polypus. The criteria are given under the head of Inversion of the Uterus (p. 350). Before removal of a polypus the diagnosis should always be completed by making sure that the sound will pass by the side of the pedicle up to or beyond the normal length. Difficulty may arise from the polypus having become adherent to a part or even the whole of the margin of the os, but some point will almost always be found at which the sound can be forced through by moderate pressure. From a polypoid cancer a fibroid polypus is distinguished by its smooth pedicle, which can usually be traced up into the cervix; by its generally smooth surface, although it may be sloughing or ulcerated in parts; and by its less readiness to bleed on touching. If a polypus springs from the edge of one lip of the external os, instead of within the cervical canal, suspicion should be felt as to its possible malignancy. Portions of retained ovum or clots may resemble a polypus within the uterine cavity, or presenting through the os, and when a portion of placenta has retained a partial connection with the uterus it has been termed by some a *placental polypus.* These are generally distinguished by the history, and by their easy removal by the finger or blunt curette. In the case of an intra-uterine fibroid polypus (Fig. 194), it may be necessary to dilate the cervix before a diagnosis can be made.

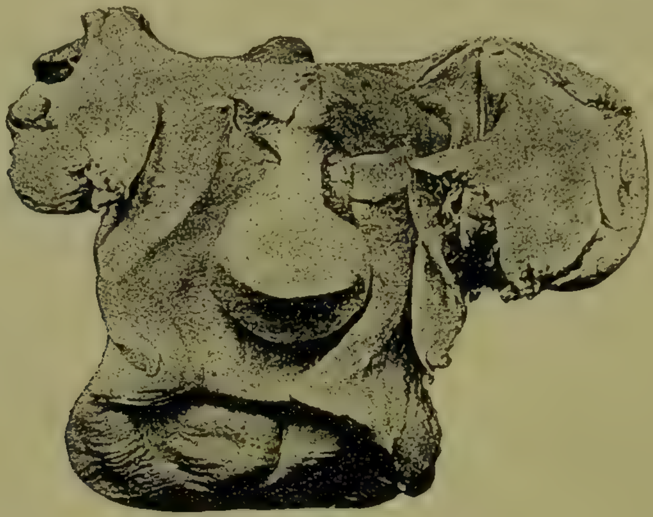

Fig. 194.—Intra-uterine Fibroid Polypus.
The polypus is laid open by an incision, and the cervix is dilated into one cavity with the fundus.
(From a photograph.)

Treatment.—In some cases, small sub-peritoneal fibroid tumours are only discovered accidentally, and produce no symptoms. These call for no treatment. In the majority of cases of small fibroid tumours not causing symptoms more serious than a moderate excess in the menstrual flow, palliative treatment will successfully carry on a patient up to the menopause, at which time symptoms are commonly, to a great extent, relieved, although the date of its occurrence is often in this disease deferred for several years beyond the usual period, not unfrequently as late as the fifty-fifth year. A very important element in the case is the age of the patient, and the consequent inference as to the number of years the tumour will have for growing before the menopause arrives. The nearer the probable date of the menopause is, the greater is the indication for trying palliative treatment. If, on the other hand, a fibroid tumour appears in comparatively early life, and is increasing, it will probably grow to great size; and it is better to remove it while the operation is easy.

If the decision is in favour of palliative treatment, all sources of hyperæmia, active or passive, should be avoided as far as possible. If the patient is single, unless the tumours are subperitoneal, of small size, and limited to the upper part of the fundus, marriage should be discouraged, unless the patient elects to face an operation as a preliminary. Married women should be warned of the probable injurious effect of coitus when there is a great tendency to hæmorrhage, and in all cases special care should be enjoined at menstrual periods. Diet should be abstemious, and alcohol used very sparingly.

In all cases of fibroid tumour causing menorrhagia, a favourable influence is exercised upon the bleeding by rest in bed or on the sofa throughout the period, or at any rate during the time when it is excessive. If a patient is content to sacrifice so much of her time, the need for an operation may often be thus averted.

The objects to be aimed at by internal remedies are to alleviate the symptoms of hæmorrhage and leucorrhœa, and, if possible, to check the growth of the tumour or cause its diminution. The drugs which are most efficacious for the former purpose tend also, by restricting hyperæmia, in some degree to promote the latter, although it is only in exceptional cases that any notable diminution of the tumour can be hoped for. Those which have been found most useful are, in the first place, ergot, and, next to this, bromide and iodide of potassium. Of the two latter the bromide is more readily borne for a long period.

Ergot, given in large doses at the time of bleeding, will sometimes check the hæmorrhage, especially hæmorrhage prolonged over the normal duration of a period. But sometimes it appears rather to increase than check the flow when given at the time of menstruation; and more often, when given at such times, it causes or increases spasmodic pain due to uterine contractions. For a permanent effect, it generally answers better to give the ergot during the intervals, and leave it off for at least five days during menstruation. Given thus, it tends to keep up tonic contraction of the uterus, and so diminish hyperæmia during the period of growth and swelling; and thus it may check the increase of the tumour, if it does not actually cause shrinking of it. To obtain its full effect it must be given over a long period, often for years, until the menopause is established. If it produces pain, or interferes with digestion, it is not worth while to persevere with it. The ergot may be given in mixture three times a day in doses of thirty minims of the liquid extract, or some corresponding liquid preparation. It is a good plan to combine with it liq. strychniæ ♏iij.—v. This aids the effect of contracting the uterus, and tends to counteract any depressant effect of the ergot upon the heart. For prolonged use, patients will often more readily take pills. Ergotin gr. iij. may then be given in pill twice or three times a day; and this mode of administration is less likely to upset the digestion.

During the period some other form of astringent or uterine sedative may be given. Thus bromide of potassium gr. xv.—xx. may be combined with tinct. hydrastis ♏xl. and tinct. hamamelidis or hazeline ♏xl. Adrenalin chloride or Oppenheimer's "Renaglandin" may be tried if hæmorrhage is severe.

Ergot is sometimes given subcutaneously, and in this way seems to produce more marked effect. But this mode of administration is naturally not adapted for prolonged use over many months and years. It may be tried in the case of severe bleeding if the alternative of operation is not accepted. There is more risk of inflammation or abscess being set up in the cellular tissue than in the subcutaneous injection of morphia or strychnia; and on this account it is usual to make the injections deeply into the gluteal muscles.

The liquid extract of ergot may be used in this way in doses of ♏x.—xxx., diluted with an equal part of water; or Bonjean's ergotin, in doses of three to five minims, dissolved in four or five parts of water. Other special preparations are used, of which one of the best is Parke, Davis, & Co.'s "ergot aseptic," in bulbs, which is physiologically standardized. Hildbrandt's formula was three grains of Wernich's aqueous extract of ergot with seven and a half minims of glycerine and the same quantity of water, but the presence of the glycerine appears to increase the local irritation. All solutions should be freshly prepared. The injections may be made daily or every other day.

Ergot is most effective in the softer varieties of fibroid, which fluctuate much in size during the menstrual cycle, especially when they are interstitial, but covered with a fair thickness of uterine wall. For sub-peritoneal fibroids it is comparatively useless. In the case of sub-mucous fibroids it often fails to check bleeding, but may help the uterus to extrude them into the polypoid form.

Calcium chloride is sometimes given in cases of fibroid tumour in doses of ten grains or more, three times a day, with the view of checking the tendency to hæmorrhage. When dysmenorrhœa is combined with menorrhagia, tincture of cannabis indica, in fifteen-minim doses, may be given three times a day in a mucilage mixture. It tends to diminish hæmorrhage, as well as to relieve pain.

Diminution of the tumour has also occasionally been obtained after the use of baths or external compresses of mineral waters containing bromine or iodine, in combination with the internal administration of the water, but more frequently the advantage to be thus gained is limited to mitigation of the symptoms. The waters of Kreuznach or Woodhall Spa are the most to be recommended, and patients with fibroid tumours are often sent for a course of treatment at these places. I have not found the effect so manifest as in the case of inflammatory effusions, but many patients think that they do receive some benefit.

In case of alarming hæmorrhage, the most effectual treatment is to plug the cervix uteri with iodoform gauze, if it is accessible; otherwise to firmly plug the vagina, and add, if necessary, a perineal pad and binder. If the hæmorrhage persists or recurs, operation is indicated.

Operative Treatment.—Modern improvements in the operation of hysterectomy have revolutionized the treatment of the graver cases of fibroid tumour. While a mortality of 10 or 20 per cent. attended the operation, there was a natural reluctance to recommend it for the cure of a disease not immediately endangering life. Now it appears to be only a question of the skill of the surgeon to enable him to remove, without appreciable risk, any fibroid tumour, provided there are no serious adhesions, septic complications, or damaged kidneys or other viscera. In the great majority of cases of fibroid tumour these conditions are satisfied, at least in the earlier years of the tumour's development.

Any patient, therefore, who has a fibroid tumour which renders her an invalid, or produces anæmia, or who has a growing tumour of considerable size, and is not very near the menopause, will be wise to choose the alternative of operation, if she is prepared to face the slight immediate risk, instead of the more remote dangers of the future.

Dilatation and Curetting.—Curetting is of service in the case of a fibroid tumour causing hæmorrhage, provided that the uterine cavity is only moderately enlarged and not much distorted. It acts by curing the congestive endometritis or adenomatous hypertrophy, which is the immediate cause of bleeding. But the effect is apt to be temporary, since the presence of the fibroid leads to a recurrence of the morbid condition of the mucous membrane.

The preliminary dilatation in itself has a favourable influence on the hæmorrhage. The full explanation of its mechanism is not quite understood, but among its uses is that it prevents any retention of blood or clots and relieves tension, sometimes allowing the uterine action to carry on the extrusion of the tumour. It appears, also, that there is such a nerve-relationship between the cervix and body of the uterus, that dilatation of the cervix tends to produce contraction of the body, just as the expulsive action of the body is associated with physiological relaxation of the cervix. This relation has been called the "polarity" of the uterus. It is generally advisable to dilate the cervix enough to allow of the introduction of the finger for exploration. The dilatation should therefore be begun with a laminaria tent, if the cervix is small at the outset, and completed, under anæsthesia, with Hegar's dilators. When the shape of the cavity is ascertained, there is the greater certainty of curetting the whole of it. Sometimes the finger may discover an intra-uterine fibroid polypus, or a submucous fibroid so placed as to be suitable for enucleation.

After dilatation of the cervix, styptic applications may be used in the form of swabs for the arrest of hæmorrhage. Swabs sometimes fail on account of the tortuous and dilated character of the uterine cavity, and it may be necessary to have recourse to injections. For this purpose, tincture of iodine, pure or diluted with one or two parts of water, may be used, or if this fails, a solution of perchloride or sub-sulphate of iron. For the precautions necessary, *see* p. 250. Curetting with the sharp curette, followed by the application of iodized phenol or other caustic, is still more effectual in those cases in which the uterine cavity is not too much enlarged or distorted to allow the whole of it to be satisfactorily reached. In cases of recurrent hæmorrhage, the application of strong nitric acid may be tried if milder means fail.

Curetting is rarely of much use in the case of large tumours, when the uterine cavity is much enlarged and too irregular for the whole of it to be readily reached, and it has been known to set up sloughing of the tumour. In such cases it is better to proceed at once to a more radical operation if interference is called for.

Enucleation through the Vagina.—The operation of enucleation is one of the most dangerous in surgery when the tumour is interstitial or its attachment to the uterine wall very extensive. The most favourable cases for its application are those in which the tumour shows some tendency to become pedunculated, so that its surface of attachment is less than its greatest diameter. As a rule it is more dangerous than hysterectomy; but, if successful, it has the advantage that it cures the patient without any mutilation. An indispensable condition is that the tumour should be covered by a sufficient thickness of uterine wall to allow it to be separated without risk of opening the peritoneal cavity.

Unless the vagina be already capacious, it should be expanded by repeated plugging or the use of dilating bags, so as to allow it to admit the whole hand, if required. The cervix should also be fully dilated by tents in the first instance, and, if necessary, by Hegar's dilators up to the largest size afterwards, and then by Bossi's dilator (Fig. 51, p. 62). If this does not give sufficient space, the cervix may be incised with scissors bilaterally up to the vaginal reflection. Some operators carry incisions much higher than this, through the lateral walls of the uterus, if the upper part of the cervix and lower segment of the body are not expanded by the tumour.

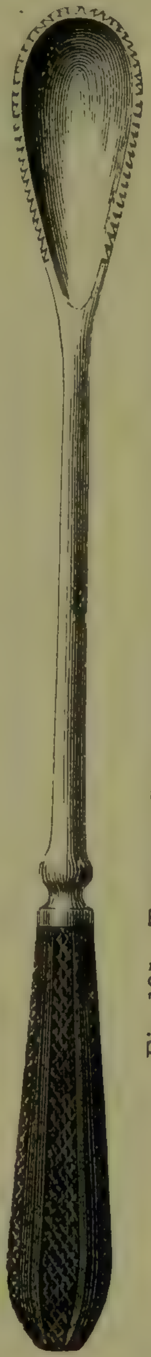

Fig. 195.—Thomas's Serrated Spoon for enucleating Fibroids.

The uterus is then pressed down by an assistant, and an incision made round the base of the tumour, where this can be reached, so as to separate the mucous membrane covering the tumour from that of the uterine wall, and divide its capsule, if one exists. The best instrument for this purpose is generally Thomas's serrated spoon (Fig. 195, p. 385), but long scissors may also be used, if there is space to adjust them accurately. Powerful vulsellum forceps should then be fixed into the tumour and traction made upon it, while its base is separated from the uterine wall by the tips of the fingers as far as possible. If bands of tissue are met with too strong to be separated by the fingers, the serrated spoon should again be used to divide them. The operation should not be commenced unless there is a reasonable prospect of removing the whole tumour. If it is only partially separated from the uterine wall, sloughing is likely to occur. The patient then runs a great risk of death from septicæmia.

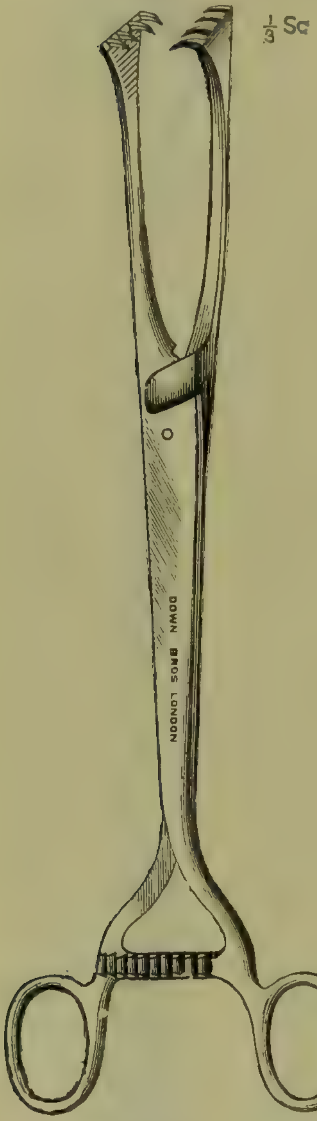

Fig. 196.
Avulsion Vulsellum

As a general rule, from the uncertainty which exists as to the amount of uterine wall which may be covering a tumour, it is preferable not to attempt enucleation unless there is evidence that the uterus is attempting to expel the tumour, in the fact that spontaneous dilatation of the cervical canal from above has commenced, and that a portion of the tumour is felt presenting at the external os. For cases of this kind there is another method, specially practised and recommended by Dr. Emmet, which is particularly suitable for the case of rather large tumours. In this the chief agent is strong traction applied to the growth, the effect of which is to excite contraction of the uterus. By the aid of this the attachment is gradually stretched out, and narrowed into the form of a pedicle, which may even be found of small size by the time the operation is finished.

Ergot should be first administered, and the os fully dilated. A powerful vulsellum is then fixed into the presenting part of the tumour, and strong traction made and continued for some time. A form of vulsellum suitable for the purpose is shown in Fig. 196. The tumour is then cut away as high as it can be reached by an écraseur furnished with a strong steel wire, or by strong curved scissors; and successive portions, as they come within reach, are afterwards treated in the same manner. If the line of attachment of the tumour can be reached, it may be separated by the serrated spoon, instead of by scissors, especially if there is much tendency to bleed. In many cases there is but little hæmorrhage, if the uterus is contracting strongly. But, if necessary, a whip-cord ligature may be passed temporarily round the upper part of the tumour by the aid of Gooch's canulæ. These are two straight metal tubes, through each of which one end of the cord is passed, and drawn through tightly. The ends of the tubes, united by the middle of the cord, are passed up side by side, and are then carried round the tumour in opposite directions till they meet at the opposite side, and so place a loop around its neck. Finally, the tubes can be fixed on to a stem having an adjustment for tightening the cords by means of a rack.

This method is comparatively easy, if the equator of the tumour is greater than its base of attachment, so that the loop of the steel wire écraseur can be adjusted around a part of it in the first instance. When the first piece has been removed, a fresh portion of the tumour will often be forced out by the contracting uterus; and successive pieces are then removed in the same way, until perhaps the final piece can be pulled out of its bed by the vulsellum. After removal of the tumour by this method of traction, the uterus is to be syringed out with hot water, and afterwards some tincture of iodine injected, if necessary, to arrest hæmorrhage. Care must be taken not to produce inversion of the uterus, and then penetrate the inverted wall.

Péan adapts his method of *morcellement* to enucleation without removal of the uterus. In the case of a large tumour, the cervix is freed by an incision through the mucous membrane around it. In front the bladder is stripped off from the cervix and behind the peritoneum, the peritoneal cavity not being opened. The uterine arteries are tied. Then the cervix is seized by a strong vulsellum at each side, and a sagittal incision is made through its anterior wall so as to expose the fibroid. Or the incision may be V-shaped or Y-shaped, the central flap being held up by a vulsellum fixed into its lower angle, so as to expose the lower part of the tumour. Doyen's "tube tranchant" may then be used to drill a large tunnel into the centre of the tumour, after which it can be seized by *morcellement* forceps, and excised in fragments. Hæmostatic forceps are used where there is much bleeding. Finally, the incision in the anterior wall of the uterus is closed by catgut suture, and the cavity is packed with iodoform gauze.

A fibroid of the cervix, if sub-mucous or interstitial, is favourably placed for enucleation. A central incision should be made across the capsule of the tumour, and the tumour enucleated by fingers or scoop. Any redundant part of the capsule may afterwards be cut away with scissors. The cervix does not contract up to close the cavity so well as the fundus. There may be some trouble, therefore, with hæmorrhage, and the cavity will generally have to be plugged with gauze. It has even proved necessary to remove the uterus afterwards by vaginal hysterectomy, to arrest the bleeding.

If the tumour is not encapsuled, but diffuse, it must be excised by a V-shaped incision, and the bleeding stopped by uniting the sides of the incision with sutures.

If the fibroid grows externally from the cervix into the cellular tissue, it may, while small, be removed by a vaginal incision, and the cavity plugged with iodoform gauze to arrest bleeding. Such tumours, however, do not generally attract attention till they are of considerable size, when they begin to cause retention of urine. At this stage there is a difficulty in arresting bleeding from a large cavity in the cellular tissue, not enclosed by any muscular wall, unless the main vessels are secured. In the absence of very strong reason for preservation of the uterus, it is better, if the tumour is of moderate size, to remove the uterus by vaginal hysterectomy. If, however, the tumour is very large, extending up into the abdomen as well as filling the pelvis, abdominal panhysterectomy is preferable, notwithstanding the difficulties of that operation under the circumstances. If the surgeon does not care to face the enucleation of the fibroid from cellular tissue, oophorectomy furnishes the alternative of an operation which, under these circumstances, is easy and involves very slight risk. It does not, however, afford the same certainty of cure. When I have performed it, it has cured the retention of urine, though the tumour has remained with only slight shrinking. I have, however, known a fibroid growing externally behind the cervix to continue to increase, and for the first time to cause retention of urine, two years after the natural menopause. For other objections to the treatment of a fibroid tumour by oophorectomy, *see* p. 391.

It was formerly advised, in the case of a sub-mucous fibroid not projecting enough into the cavity for enucleation, to make an incision across the face of the tumour deep enough to divide completely the mucous membrane and capsule of the tumour. This was sometimes followed by extrusion of the tumour; but there is a risk of its setting up gangrene. With the improved results of hysterectomy, that operation is much safer.

If the tumour so far approximates toward the pedunculated form that a wire loop can be securely applied around its base, the best mode of removal is by means of the écraseur, fitted with a single steel wire of fair thickness. The écraseur itself must be so strong that there is no risk of its stem bending. The wire should not be too much annealed, and, if the tissue to be cut through is very thick, steel piano wire, quite unannealed, is the best to use. This is extremely strong, though rather rigid to work with. A considerable stiffness in the wire loop, however, assists the operator in passing it up over the equator of the tumour, since it regains its shape and position within the uterus. An extra supply of wire in hank must be kept ready, in case the first loop should break. A loop at one end of the wire is fixed to the moving button of the écraseur (Fig. 212, p. 411); the other end is kept long and unattached, so that the size of the loop can readily be varied as required, till it has been got above the equator of the tumour, the stem of the écraseur being pushed up as high as it will go between the tumour and the uterine wall in front, or wherever the attachment of the tumour reaches lowest. The slack of the wire is then drawn in, and the free end twisted round the crossbar of the écraseur by means of strong pliers. If the tumour is not completely cut through when the button is screwed up to the full, the wire must be removed from the button, and re-attached to it after the button has been screwed down again to the bottom. If the slice removed does not comprise the whole tumour, the écraseur is to be again applied, if possible, to what remains, in a similar way, until the whole is removed flush with the uterine wall; or the final portion may be seized with vulsella and enucleated out of its bed. The compound wire of twisted strands should never be used to cut through thick, tough tissue, since it is much more likely to break.

The galvanic écraseur may be used instead of the ordinary écraseur, but the pliant loop of platinum wire is much more difficult to pass into position beyond the reach of the fingers than the stiff one of steel wire. Moreover, the batteries used for medical purposes have rarely power enough to heat sufficiently a loop of the requisite size to cut through a very thick tumour when in contact with moist tissues, and, if not heated enough, the wire will break.

It sometimes happens that a fibroid of very large size becomes partially extruded by uterine action into the vagina, or even appears at the vulva. The base of attachment may still remain large, and it will generally be impossible, after the os has become retracted, to determine its dimensions by any method of sounding. Sometimes it is not possible even to reach any point of the margin of the dilated os. This condition is distinguished from inversion of the uterus by the great size of the mass in the vagina, and by recognition of the fundus in its normal direction, but carried upwards by pressure. The functions of the bladder and rectum then become impeded, and, if the pelvis is completely filled, nervous symptoms may arise similar to those resulting from impaction of the fœtal head in parturition. In any case, the patient is exposed to the risk of septicæmia from sloughing of the tumour. In this case also the tumour may be removed by the écraseur, fitted with a strong unannealed steel wire, in the manner already described. The loop is passed over the portion of tumour in the vagina, and, if possible, over its equator. It may then be possible to slip it up to its pedicle or base, the os uteri being generally so flattened out against the pelvic wall as not to offer an impediment. If not, as much of the tumour as possible must be taken off at first, and then the remainder, if necessary, in successive slices, the écraseur being passed up within the uterus. If it is not found possible to remove the whole of the tumour in this way at one sitting, it is better at once to perform abdominal panhysterectomy; otherwise sepsis is very probable.

Oophorectomy.—In most cases the urgent symptom of fibroid tumours, namely, the menstrual hæmorrhage, can be arrested by removal of the uterine appendages. Generally, also, if the operation is successful in inducing an artificial menopause, it arrests the growth of the tumour, and eventually leads to its gradual diminution by a process similar to the senile atrophy which occurs after the natural menopause. In some cases, however, the tumour may continue to grow, just as, exceptionally, it may grow after the spontaneous menopause. This is more likely to be the case if the tumour is of the soft, non-encapsuled variety. In other cases, again, the operation fails to arrest menstruation, and there is then generally no effect produced on the growth of the tumour. Sometimes this may have been due to the fact that, owing to the ovaries having been spread out on the surface of the tumour, some ovarian tissue was left behind at the operation. But I have more than once performed hysterectomy after oophorectomy had failed to arrest menstruation or the growth of the tumour, and have found absolutely no trace of ovarian tissue discoverable.

It was maintained at one time by Lawson Tait that it is chiefly of importance to remove the Fallopian tubes rather than the ovaries. He always retained the opinion that the removal of the tubes is essential, and that it is of little consequence whether absolutely the whole of the ovarian tissue is removed.

Others believe that the greater effect produced by removing tubes as well as ovaries is due to the ligatures being placed more deeply in the broad ligaments, and so cutting off more of the arterial supply to the uterus. My own experience leads me to believe that the old doctrine, that ovulation and menstruation are generally connected, is a true one, and that it is of importance not to leave any ovarian tissue even on the distal side of the ligatures, where it may retain its vitality. But it is generally agreed that a more certain result is obtained by removing both tubes and ovaries than by removing ovaries alone.

Oophorectomy is generally an easy and safe operation in the case of small fibroid tumours not much exceeding the size of the uterus at four months' pregnancy. In such cases it has usually succeeded in stopping menstruation and the growth of the fibroids, and has so far proved itself a good operation. But it has been superseded for the most part by a better, now that hysterectomy can be performed without materially greater risk.

Oophorectomy is inferior to hysterectomy, for the following reasons: First, it may fail to stop the growth of the tumour or the hæmorrhage; secondly, the tumour remains, and may give rise to more or less trouble, even if the menopause is established; thirdly, it is found that, if the uterus is removed and one or both ovaries are left, the nerve symptoms of the menopause, flushes, heats, perspirations, and the like, are less severe than they often are if the menopause is brought on by removal of the ovaries; fourthly, under the same circumstances, there is no fear of impairment of sexual function, or of the symptoms of neurasthenia, hysteria, or even mental disturbance, which sometimes follow oophorectomy.

Oophorectomy is therefore now generally reserved for cases in which it is found, on opening the abdomen, that there is some condition which renders hysterectomy specially difficult and dangerous, while the ovaries are easily accessible. Thus, when the fibroid tumour is one of the cervix, or is buried very deeply in a broad ligament, oophorectomy may be very much the easier operation. Even in such cases, however, I have of late chosen hysterectomy in preference.

The general considerations connected with the operation, and the mode of performing it, will be discussed in the section on Diseases of the Fallopian Tube (Chapter XI.). Only those points which are special in the performance of the operation on account of a fibroid tumour will here be noted. In the case of a fibroid tumour, the guides to finding the ovaries are the broad ligaments, on the posterior surfaces of which the ovaries are to be felt for. These are generally low down at the sides of the uterus, if the whole fundus is enlarged. A small incision, not exceeding two inches in length, should therefore be made in the first instance, not too high up. If it is very difficult to reach the ovaries, the incision may have to be enlarged. To secure the ovary of one side, the fundus uteri should be pushed over as much as possible towards the opposite side.

In the case of a tumour growing into the broad ligament, the mesovarium is often found shortened and spread out, so that it is difficult to get ligatures between the ovary and the tumour. It is then of special importance to pass the needle through the ligament of the ovary. The angle of the ovary next to the ligament, which is that most closely attached, can then be safely cut away very close to the ligatures. Ovary and tube can generally be included in one ligature. In order to attain this result, the needle may be passed backward and forward through the mesosalpinx if necessary. In the case of great difficulty in finding an ovary, if the round ligament can be traced, it will be a guide to the point of origin of the Fallopian tube and ligament of the ovary. No drainage should be used after oophorectomy, unless there is a complication with pelvic abscess or pyosalpinx. If there is bleeding from the uterus after separation of adhesions, which cannot be arrested, it is better to remove the uterus.

Vaginal Hysterectomy.—If hysterectomy is decided on while a fibroid tumour is small, the uterus may be removed by vaginal hysterectomy. This operation has the advantages that the mortality is low, there is very little shock from it, and an external scar is avoided. On the other hand, the operation is not so aseptic as an abdominal section; the pedicles in the vagina slough, and cause an offensive discharge; there is more pain for the first twenty-four hours if clamps are used; and complete healing of the wound is less rapid than after abdominal hysterectomy. The operation may generally be preferred with tumours at any rate up to the size of the uterus at three months' pregnancy or rather more.

By special expedients its scope may be extended much beyond this; and Péan has shown that, by the method of *morcellement*, fibroid tumours up to the size of a uterus at five months' pregnancy or more may thus be removed, with a low mortality.

But, now that abdominal hysterectomy may be performed with as low a mortality, and with much less hæmorrhage and less difficulty, there appears to be no object in performing the operation, under greater difficulties, through the vagina.

The operation of vaginal hysterectomy is described in the section on Carcinoma of the Uterus (p. 429). The following modifications are called for, if it is performed for the removal of a fibroid tumour.

The opening from the posterior vaginal fornix into the peritoneum must be made wide, in order to allow the enlarged fundus to come through. Unless the tumour is quite small, the uterus will generally have to be pulled straight down, and not retroflexed or anteflexed. If the fundus is not easily pulled down, after the uterine arteries have been secured and the uterus cut away from the lower part of the broad ligaments, including the utero-sacral ligaments, the uterus should be bisected by sagittal incisions on the anterior and posterior walls from below upward, strong traction being made by vulsella fixed on each side of the cervix. As the incision is prolonged upwards, other vulsella fixed at each side of it aid in bringing the fundus downward into reach. If the bisection can be completed, each half of the uterus separately can easily be drawn down externally. Failing this, if the fundus still refuses to come through the opening, the tumour and the uterus must be seized by vulsella and cut away piecemeal, according to the method described for enucleation by *morcellement* (*see* p. 387).

Abdominal Myomectomy.—A fibroid tumour can be excised or enucleated from the peritoneal surface of the uterus. This operation, however, has a much less wide scope than hysterectomy. The conditions for it are that there should be only one fibroid tumour of consequence, or, at any rate, not more than two or three, and that they should be of the encapsuled variety. The operation is in most cases more dangerous than hysterectomy, the safety of which lies in the vessels being secured altogether outside the uterine wall. It is also an objection to it that encapsuled fibroids are almost always multiple, and thus small fibroids will almost always be left, which may afterwards grow and give trouble. Hence the operation should generally be reserved for cases in which it is important to preserve the uterus for future pregnancy, and in which the patient is willing to run some additional risk rather than be deprived of the possibility of pregnancy.

In one case the operation is a safe one, namely, when a sub-peritoneal fibroid has become so completely extruded outside the uterine wall, that it is connected with the uterus only by a narrow pedicle consisting of connective tissue. The pedicle may then be transfixed by a double ligature of silk, Chinese twist No. 4, and tied in two halves, and then by a loop encircling the whole.

If the pedicle is thicker and consists of myomatous tissue, it is not safe to tie it in this manner, for such tissue does not behave well when encircled by a ligature, but is apt either to slough, or to shrink and allow bleeding. It is necessary to excise the tumour by a V-shaped incision through the pedicle. The bleeding is then arrested by tying individually with fine silk any arteries that can be seen, uniting the cut sides of the V by a series of buried sutures in one or more tiers, and finally uniting the peritoneal edges. Chromic or formalin catgut is generally used for the purpose; but silk in interrupted sutures may be used, if the loops are not touched by the fingers, and is more certain not to get slack and allow bleeding.

To enucleate a sub-peritoneal fibroid which bulges but slightly, or an interstitial fibroid, a central incision is made across the capsule, and the fibroid enucleated by fingers or scoop. The vessels are to be tied, if possible, where the tumour has its chief attachment to the uterine wall. The redundant part of the capsule may afterwards be excised if necessary, but there is less bleeding if the central incision only is made. Afterwards the cavity is closed by buried sutures, and finally the peritoneum. If the uterine cavity should be opened during the enucleation, a drain of iodoform gauze is passed from the cavity formed by the bed of the tumour, through the cervix, into the vagina.

Before these proceedings an elastic ligature, consisting of a piece of rubber tubing secured by catch forceps, may be placed around the lower part of the uterus. But this has the disadvantage that, as soon as the ligature is taken off, bleeding occurs with redoubled vigour, and therefore it is better to do without it if possible. The peritoneal cavity must not be closed till all bleeding has ceased.

Supra-vaginal Hysterectomy.—In this operation the body of the uterus is removed by abdominal section about the level of or a little below the internal os, and the greater part of the cervix is left. It is now considered by most to be the best operation for the removal of a fibroid tumour, in the majority of cases, although some operators prefer in all cases to perform panhysterectomy, in which the whole uterus, including the cervix, is removed.

The patient is placed in the Trendelenberg position, with the head toward the window, and, if possible, with an overhead light also available, to shine down into the pelvis. The abdominal incision is made long enough to allow the tumour to be turned out without much difficulty. In case of displacement of the bladder upwards by a tumour behind the cervix, care must be taken to open the peritoneum first high up near the umbilicus, and not to run any risk of wounding the bladder. When the peritoneum has been opened, the incision through muscles and fascia should be prolonged down to the pubes, to allow the muscles to be well separated. The incision through peritoneum need not descend so low, if the bladder lies in the way.

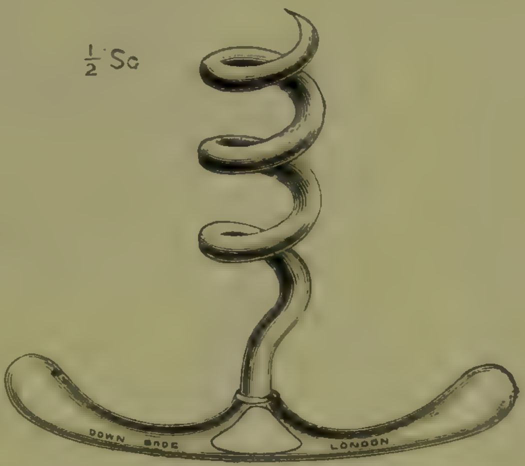

Fig. 197.
Greig Smith's Myoma Screw.

The operator then turns the uterus out of the abdomen by passing the hand down behind it, and pulling it up. Any mass lying in the pelvis, but not sub-peritoneal, can usually be lifted out in the same way. In case of a mass firmly impacted in the pelvis, the form of corkscrew shown in Fig. 197 is sometimes used to pull it up, being screwed into the mass.

The tumour being turned out, it is useful to apply Doyen's retractor (Fig. 71, p. 83), and secure it to the clamp under the thighs.

In some cases of sub-peritoneal tumour, or one buried deeply in the broad ligaments, it is impossible to turn out the uterus until the ovarian arteries have been secured and the outer parts of the broad ligaments divided. This part of the operation must then be carried out with the uterus *in situ*. It may even be necessary to strip the bladder from the front of the tumour before the uterus is turned out.

If the uterus can be turned out, a large, thick, flat pad is at this stage packed down behind the uterus and broad ligaments, covering in the intestines and holding them back from the field of operation.

The first step is to decide which ovary should be left, or whether both should be left. It is generally easier to leave one than both, and the patient is none the worse off afterwards. If the ovary and tube are healthier on one side than the other, the healthier side should be left. If one ovary lies higher up on the surface of the tumour, it is more convenient to remove the one which lies higher. Other things being equal, it is better to leave the right ovary than the left, since ovarian pain is commoner on the left side.

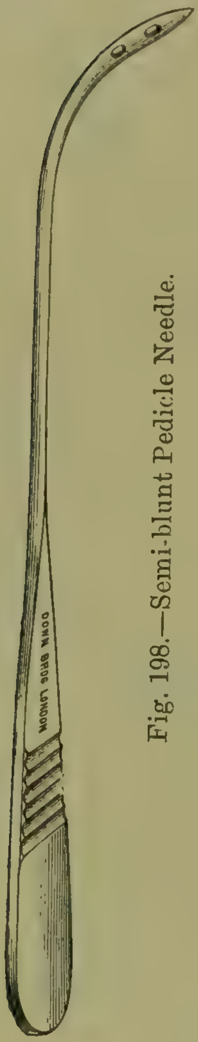

Fig. 198.—Semi-blunt Pedicle Needle.

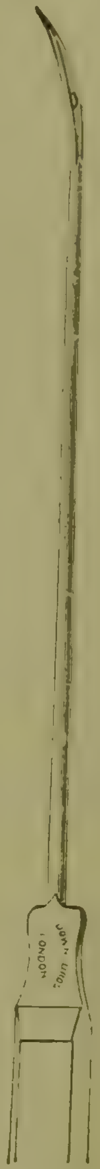

Fig. 199.—Sharp Pedicle Needle.

The most convenient needles to use for passing ligatures are the semi-blunt pedicle needle, Fig. 198, which may be pushed through the broad ligament low down without fear of wounding intestine; and the sharp needle (Fig. 199), which is used at a higher level, especially when denser tissue has to be penetrated. The main ligatures are all of silk, No. 4 Chinese twist.

Supposing that the right ovary only is to be left, the needle, carrying a double ligature, is passed below the ovarian vessels near the outer border of the left broad ligament, and below the ovary. One loop is tied over the free border of the broad ligament, securing the ovarian artery (L O A on right side of Fig. 200). A small clamp is next placed on the distal side of the ligature, between it and the ovary, to secure the ovarian veins. Kocher's artery forceps (Fig. 201, p. 398) answer the purpose well, as they are very light, and the points at the ends of the blades prevent their slipping. Then the second loop is passed by means of the sharp pedicle needle again through the edge of the broad ligament, close to the ovarian vessels. It is tied up, the ends of it are temporarily left long, and secured by pressure forceps, as shown in Fig. 200. This second ligature prevents the ovarian artery retracting out of the grasp of the first, and gives command of the edge of the broad ligament.

Next a single ligature is passed from before backwards through the broad ligament just inside the round ligament, and from behind forwards just outside it. When tied, this ligature secures the small artery accompanying the round ligament, and unites the two faces of the broad ligament at this spot (L R L, Fig. 200). In case the tumour has spread into the broad ligament, so that the round ligament lies on its surface, the peritoneum is first divided in front and at the back, and the tumour enucleated before this ligature is applied, the divided round ligament being meanwhile secured with pressure forceps.

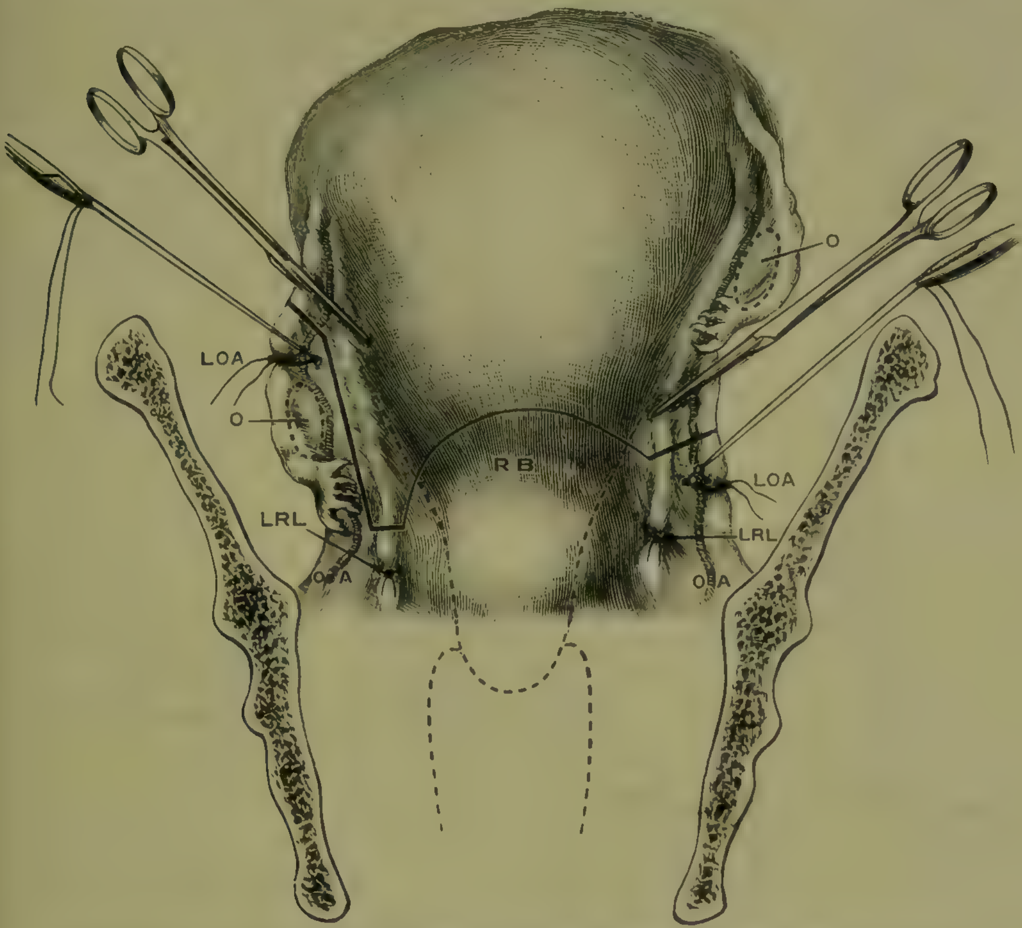

Fig. 200.—Operation of Supra-vaginal Hysterectomy, seen from the front. First stage.

A double ligature is placed on both ovarian arteries, and a single ligature on both round ligaments. The thick black line indicates the line of incision through the broad ligaments; the thin black line, the line of division of the anterior peritoneum; L O A, ligature on ovarian artery; L R L, ligature on round ligament; O, ovary; O A, ovarian artery; R B, reflection of bladder.

An incision is then made in the direction of the thick line seen on the right of Fig. 200, dividing the broad ligament up to and including the round ligament.

On the right side (left-hand side of figure) the ovarian artery is tied in a similar way, with a double ligature, between the ovary and the angle of the fundus uteri, and a clamp is placed above the ligature to secure the veins. The round ligament is tied with a single ligature at a point corresponding to the ligature on the left round ligament. Then an incision is made in the direction of the thick line on the left-hand side of Fig. 200, first dividing the ovarian vessels, then passing down between the ovary and tube and the round ligament, and finally turning inward and dividing the round ligament when it reaches the level of the incision on the other side.

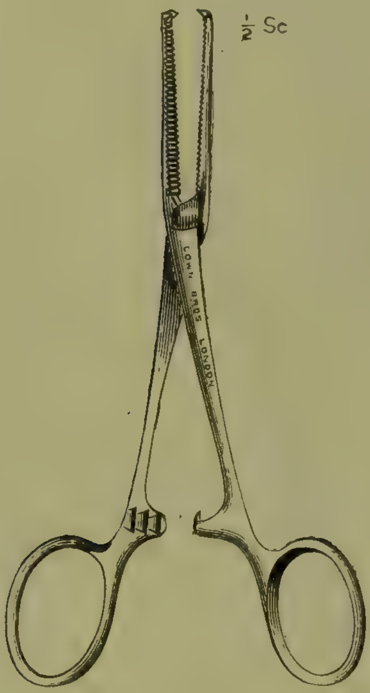

Fig. 201.
Kocher's Artery Forceps.

Care must be taken not to cut too close (not under three-quarters of an inch) to the ligatures on the ovarian arteries. If for any reason it is necessary to do this, the cut end of the ovarian artery should be tied separately with fine silk, as it has a tendency to retract out of the ligature.

Just within the round ligaments begins the area which may be occupied by the bladder. To separate the bladder from the uterus, an incision is made through the anterior peritoneum from one round ligament to the other, in the direction indicated by the thin black line in Fig. 200. The line is convex upward, and lies from one to two inches above the reflection of the bladder from the uterus, which can be easily seen and felt.

The operator then strips down the peritoneum with the cellular tissue beneath it, in a flap as shown in Fig. 201, p. 400, keeping close to the wall of the uterus, and extending the separation to the broad ligaments at the sides of the uterus. The tortuous uterine arteries, accompanied by large veins, are then seen and felt pulsating a little outside the border of the uterus.

If the first clamp has not secured the uterine as well as the ovarian veins, a second clamp on each side is now placed on the broad ligament below the first clamp, and just above the line where the incision is to be, to secure the uterine veins. A Doyen's clamp (Fig. 202) is the best for the purpose, and the point of it should be placed as close as possible up to the border of the uterus. To avoid confusion, these clamps are not shown in the figure. Their use is necessary; otherwise the needle used to place the ligature on the uterine artery may pierce a vein, and then profuse venous bleeding occurs, and obscures the field of view.

The semi-blunt pedicle needle, carrying a double ligature, is now passed through the broad ligament just within the uterine artery, and the loop divided. One of the posterior ends is brought back from behind forward just outside the uterine artery. This ligature is tied up, thus securing the uterine artery, and the ends cut short. The same is done on the opposite side. The tumour is then removed by cutting straight across the cervix, below the level of the tumour, thus uniting the incisions made through the outer part of the broad ligaments. (*See* Fig. 204, p. 401.)

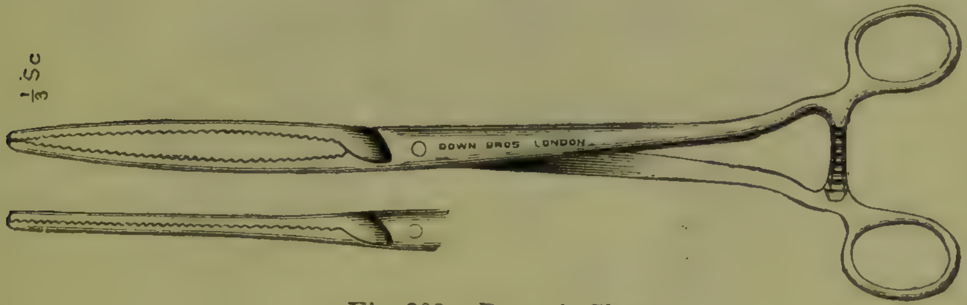

Fig. 202.—Doyen's Clamp.

The unused ligature left on the inside of each uterine artery is then used to stitch down the anterior peritoneal flap, and thus unite the faces of the broad ligament at the situation of that artery. The sharp pedicle needle is passed from before backward through the peritoneal flap, and is threaded by the anterior end of the ligature, which it brings to the front. It is then passed a little farther out, first through the peritoneal flap, then through the broad ligament outside the uterine artery and veins, and is threaded by the posterior end of the ligature, which it brings also to the front. In Fig. 204, p. 401, the ends of the ligatures before tying up are shown united by the brackets at each side.

It is advisable, for additional security, to tie the cut ends of the uterine arteries with fine silk. Any additional small arteries at the sides of the uterus are also tied. There is rarely much bleeding from the cut surface of the cervix if that surface is some way above the level of the ligatures on the uterine arteries. Any small vessel in it which continues to bleed is secured by passing a ligature of fine silk under it in figure-of-eight form by a curved Hagedorn needle passed successively in two directions at right angles to each other.

Finally, the peritoneum has to be stitched securely over the cut surface. This is done by a continuous suture of silk, Chinese twist No. 2, carried across from the left side to the right by means of a curved Hagedorn needle. The ligatures on the ovarian arteries, and the second ligatures on the uterine arteries, which are left long till the end of the operation, enable the assistant to hold up their respective parts of the broad ligaments. The cervix may be held up by catch forceps placed upon its posterior peritoneal

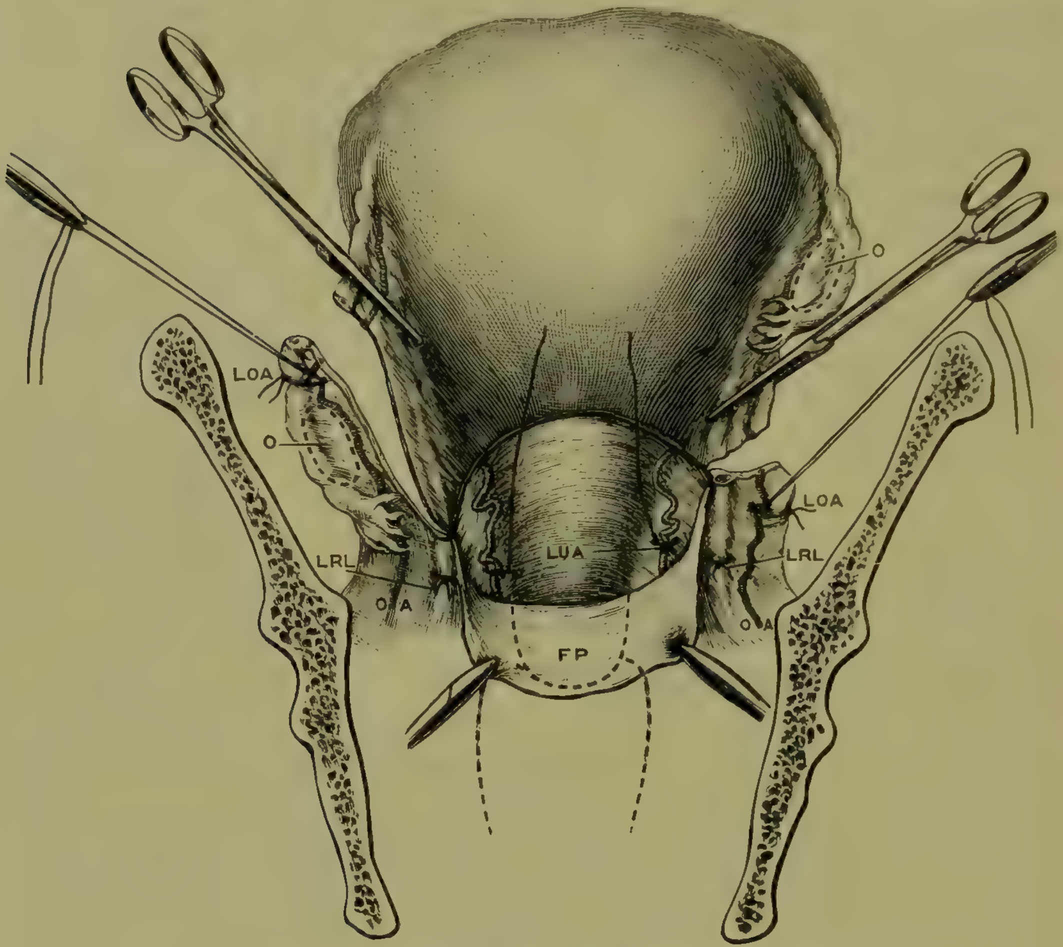

Fig. 203.—Operation of Supra-vaginal Hysterectomy, seen from the front. Second stage.

The outer part of the broad ligament is divided on each side. The anterior peritoneal flap is stripped down and held by two pressure forceps. One ligature is placed on each uterine artery. A second ligature is passed through the broad ligament just within it, ready for subsequent use. L O A, ligature on ovarian artery; L R L, ligature on round ligament; L U A, ligature on uterine artery; O, ovary; O A, ovarian artery; F P, anterior flap of peritoneum.

edge. If a large gap remains in a broad ligament from enucleation of a fibroid out of it, it may first be united by a lower tier of buried suture, care being taken not to include the ureter. In passing the peritoneal suture the needle should be made to pierce the anterior peritoneum twice, and the posterior once. Thus a sero-fibrous union, the most secure of any, is obtained. When the whole is completed the pelvic floor is covered quite smoothly with peritoneum. On two occasions I have had to open the abdomen again, two years or more after the operation, on account of the condition of the ovary left unremoved, and have found the line of suture quite free from adhesion.

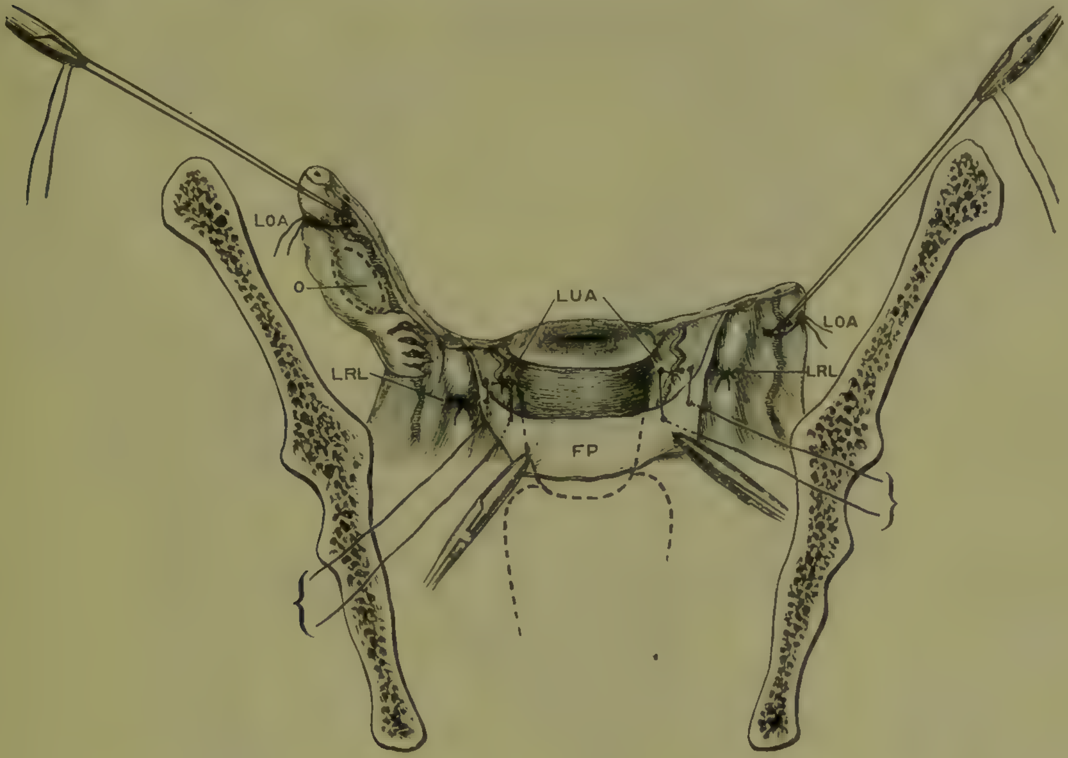

Fig. 204.—Supra-vaginal Hysterectomy, seen from the front. Third stage. The uterus has been cut away. The ligature on each side, for stitching the anterior peritoneal flap over the uterine artery, is passed and ready for tying. L O A, ligature on ovarian artery; L R L, ligature on round ligament; L U A, ligature on uterine artery; O, ovary; F P, anterior flap of peritoneum.

The arrangement of ligatures above described may seem needlessly elaborate. The object of them is to unite the two faces of the broad ligament, so that no pouch is left, into which blood could be effused, except just over the stump of the uterus: and to prevent any of the main ligatures from being exposed in such a pouch. The only ligatures sometimes so exposed are the small figure-of-eight ligatures of fine silk buried in the cut surface of the uterus. It is easy to keep these aseptic, by never touching the loops with the fingers. No flaps are cut from the uterus, but the cervix is cut straight across at the narrowest part, so that there is the smallest possible surface to bleed. The cervix is not stitched up, but its canal is left free for drainage, if required, of the pouch covered by peritoneum. Sometimes there is no appreciable discharge; sometimes there is a slight sanguineous discharge through the vagina for a day or two. In performing the operation, however, on the puerperal uterus, as a completion of Cæsarian section, I have sometimes found it necessary partially to stitch up the dilated cervical canal to arrest bleeding from the cut surface.

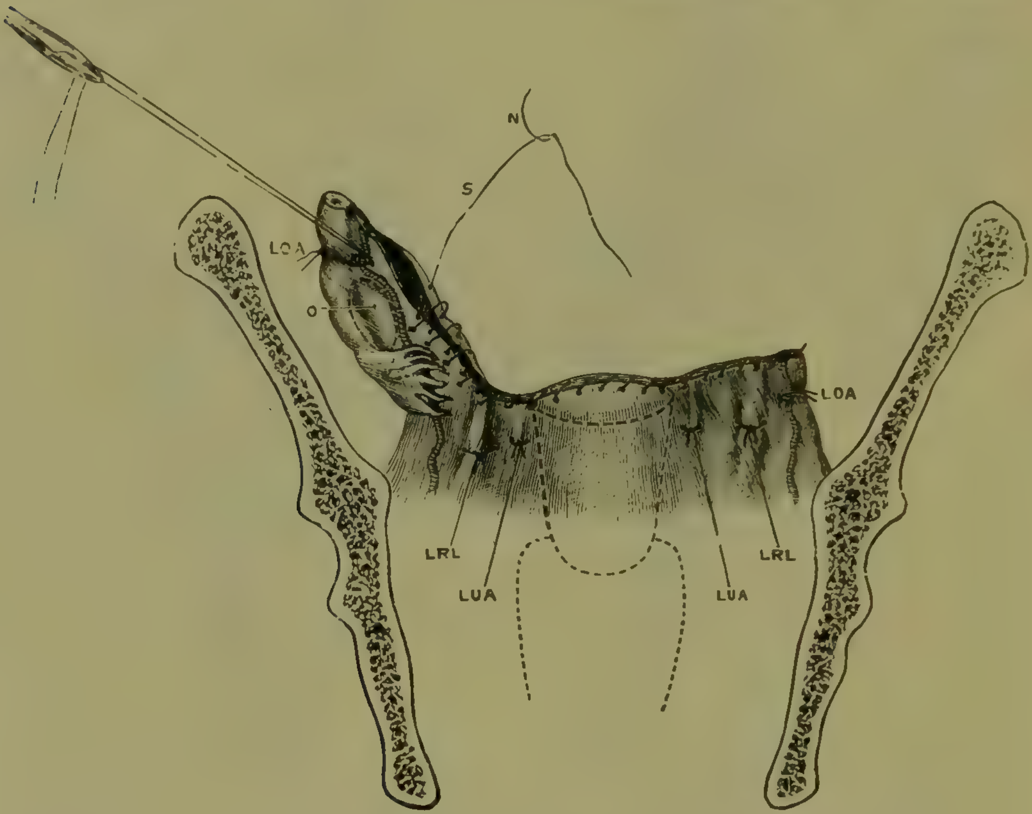

Fig. 205.—Supra-vaginal Hysterectomy, seen from the front. Fourth stage. The continuous suture, uniting the peritoneum, is nearly completed. All the main ligatures are cut short, except that on the right ovarian artery. L O A, ligature on ovarian artery; L R L, ligature on round ligament; L U A, ligature (second) on uterine artery; O, ovary; S, continuous suture; N, needle.

Since adopting this method of ligatures, in 1896, I have not had any death from supra-vaginal hysterectomy, with the exception of one from the anæsthestic at an early stage of the operation.

Abdominal Panhysterectomy.—In some cases supra-vaginal hysterectomy is not available, as when the fibroid tumour is situated in the cervix, extending down to the external os. In others panhysterectomy may be preferable, as when the cervix is lacerated or inflamed, and is likely to cause leucorrhœa in the future, or to become affected by carcinoma. If for any reason drainage is thought advisable, as when there is a complication of pyosalpinx or pelvic suppuration, and pus has escaped into the pelvic peritoneum, or when extensive adhesions have been separated and are likely to cause sanguineous effusion, the best mode of drainage is to remove the cervix and leave the central portion of peritoneum unstitched. Again, if there is a great gap in the cellular tissue from enucleation of a fibroid tumour from the broad ligament, panhysterectomy may be chosen with the view of draining this gap. In most cases, however, the gap may be closed up by the method of sutures described for supra-vaginal hysterectomy.

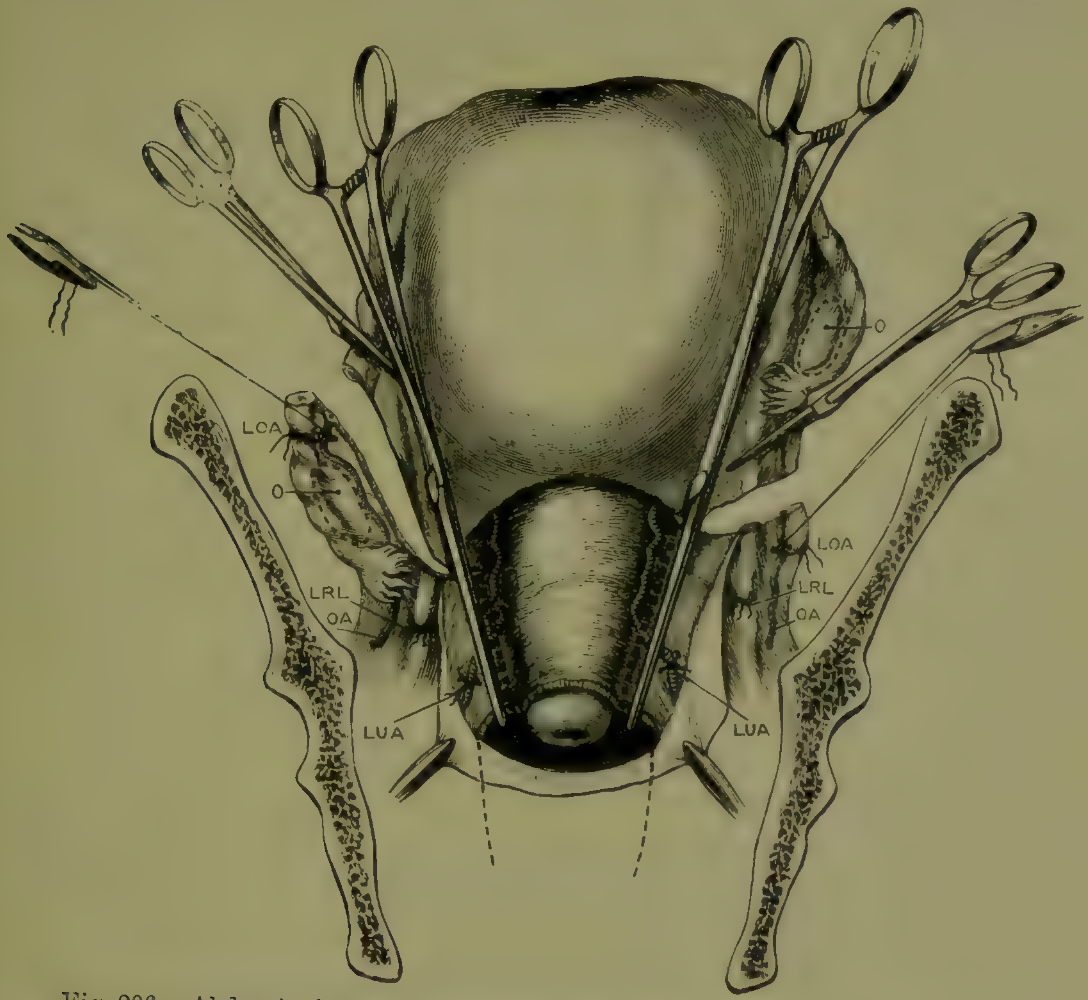

Fig. 206.—Abdominal Panhysterectomy, seen from the front. Final stage. The uterine arteries have been tied, and thin clamps placed upon the remaining parts of the broad ligaments, posterior and anterior vaginal fornices being opened. The dotted lines show the lines of incision to separate the uterus. L O A, ligature on ovarian artery; L R L, ligature on round ligament; L U A, ligature on uterine artery; O, ovary; O A, ovarian artery.

Panhysterectomy may be performed by the same method as supra-vaginal hysterectomy up to the stage at which the uterine arteries have been tied (Fig. 203, p. 400). The operator then, instead of cutting across the uterus, opens the posterior vaginal fornix from the pouch of Douglas. An assistant pushes up the fornix by means of a pair of forceps passed into the vagina, the ends of which are slightly separated. The operator cuts into the vagina with scissors between the points of the forceps, and then, the forceps being withdrawn, extends the opening laterally, with scissors, each way as far as the broad ligaments. He then passes two fingers of the left hand through the opening into the vagina, and, the bladder having been stripped down from the upper inch of the anterior vaginal wall, uses the tips of his fingers as a guide for opening the anterior vaginal fornix from above. This opening is also extended laterally as far as the broad ligaments, and the uterus then remains attached only by the lower part of each broad ligament.

A thin Doyen's clamp is now passed down on each side to secure this part of the broad ligament, so that the tips of the blades are in the vagina, as shown in Fig. 206, p. 403. These thin clamps are elastic enough to compress the tissue without damaging it. The uterus is then cut away along the dotted lines shown in the figure, a margin of tissue being left inside the clamp. The uterus being removed, two or three pressure forceps are placed on this margin of tissue at each side, and each clamp in succession is slackened, without being removed, to allow the tying with fine silk of any small arteries which bleed. Then the clamps are removed, as well as the pressure forceps. Generally several cervical arteries require a ligature. But if the uterine artery has been tied well outside the position of the ureter there is little or no bleeding, since the cervical artery comes off from the uterine artery near the ureter.

Finally, a strip of sterilized moist iodoform gauze, 10 per cent., is passed from above downwards into the vagina, the upper end being packed into the space from which the cervix has been removed, and any gaps which may exist in the cellular tissue or broad ligaments. Over this the anterior and posterior edges of peritoneum are stitched completely together by a continuous suture of silk (Chinese twist, No. 2), extending from side to side of the pelvis, similar to that shown in Fig. 205, p. 402. If drainage of the peritoneal cavity is desired, a suture is used at each side, and the centre for an inch or more is left open. If necessary another strip of gauze is passed into the vagina from below, in order to fill it moderately.

Another plan is to secure the uterine artery only by tying the cut end with fine silk, so that no transfixing suture may be exposed to the liability of septic contamination from the vagina. The artery may be seized by pressure forceps just before it is divided by prolonging the transverse incision through the broad ligament up to the wall of the uterus, or it may be seized as soon as it spurts. This is not difficult if the uterine veins have been secured by distal clamps. After the uterine arteries have been secured, the uterus is separated by an incision which keeps quite close to the uterine wall, inside the lower course of the uterine arteries.

If, however, the second ligature on the uterine artery is used to stitch down both faces of the broad ligament over the artery, as shown in Fig. 204, p. 401, the ligatures are not exposed to the vagina, and the broad ligament is better closed up.

The gauze plug may be changed after two or three days, and afterwards at intervals of twenty-four or forty-eight hours up to a week, when douches with a non-poisonous antiseptic, such as chinosol, 1 in 400, may be commenced.

Doyen's Operation of Panhysterectomy.—This method of operating is highly praised by some operators. Its essence consists in making the separation of the uterus from below upwards, not from above downwards.

The first step is to open the posterior vaginal fornix from the pouch of Douglas, after the tumour has been drawn out of the abdomen and pulled forward as far as possible over the pubes. A pair of forceps is pushed up by an assistant into the posterior vaginal fornix. A strong silk ligature is passed through the vaginal wall behind the spot where the opening is to be made, and serves later to hold up the posterior lip of the peritoneal wound. The vagina is then opened between the points of the forceps.

Through the opening Doyen's special hook-vulsellum, or *érigne*, is next passed in, and seizes the anterior lip of the cervix, or, if this is impossible, the posterior lip. Strong traction is made upon the vulsellum, and the posterior and lateral attachments of the uterus are divided as far as the lower border of the broad ligament. The myoma screw, Fig. 197, p. 395, may be used to aid in dragging the fundus forward over the pubes.

The anterior lip of the cervix is now seized with a vulsellum, if this has not been done already. The operator separates the anterior vaginal fornix from the cervix by an incision with scissors at its junction, still making strong traction on the cervix with the vulsella. With the finger the cervix is stripped off the bladder from below upward, until the anterior peritoneum is reached and divided. The uterus is now attached only by the broad ligaments.

The uterus is now drawn to the left; an assistant seizes the right broad ligament between the finger and thumb, and the operator separates the ligament from the uterus by cutting from below upward quite close to the uterine wall. Any vessels that bleed toward the lower part of the incision are tied. The pedicle of the right appendages is then transfixed by a silk ligature and tied in two halves. The appendages are cut away, and the ends of the ligature left long. The left broad ligament and left appendages are next treated in the same way, and the uterus so removed.

The ends of the ligatures tying the pedicles of the uterine appendages are now drawn down into the vagina with long curved forceps. The vaginal mucous membrane is united by a few interrupted sutures to the peritoneum. Finally, the peritoneum is closed by a purse-string suture which includes the posterior peritoneum, the vesical peritoneum, and that of the pedicles of the appendages.

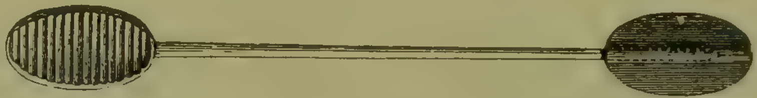

Fig. 207.
Guarded Pin for fixing pedicle in abdominal wound.

Extra-peritoneal Treatment of the Pedicle.—The old method of hysterectomy was by the extra-peritoneal treatment of the pedicle, and by this a mortality not exceeding 10 per cent. was obtained by skilful operators in cases to which it was applicable. But a tumour of the cervix, or one burrowing deeply into the broad ligament, could not be removed at all in this way. The chief objections to the operation are that the pedicle has to slough, and so retard convalescence, and that a weak point in the abdominal wall is left at its attachment, which involves a liability to subsequent ventral hernia. Moreover, the modern methods now give a reduced mortality.

The operation might still be chosen in an emergency by a surgeon inexperienced in abdominal section, and in the absence of facilities for the Trendelenberg position; since it can be performed easily and quickly, provided that there is sufficient length of cervix free below the tumour to allow it to be fixed as a pedicle to the abdominal wall without too great tension. As performed upon the puerperal uterus after Cæsarian section, it constitutes the original Porro's operation.

The best implements for it are guarded pins of delta metal and Koeberle's serre-nœud fitted with wire of delta metal or soft iron. Delta metal has the advantage of not rusting, and the serre-nœud may also be made of it.

The tumour is first turned out of the abdomen. The loop of the serre-nœud is then passed round the neck, below the level of the ovaries. The loop at one end of the wire is attached beforehand to the button. The other end is passed round the neck of the tumour, drawn up pretty tightly with pliers, and twisted close round the button. The screw is then turned till there is sufficient constriction to prevent hæmorrhage. Two guarded pins are passed transversely through the neck as closely as possible above the wire loop, so as to lie on the surface of the abdomen and hold up the pedicle. The tumour is then cut away, and any superabundant tissue afterwards trimmed off. The serre-nœud may then be tightened a little further, and, if secondary hæmorrhage occurs after an interval, from shrinking of the tissue, a slight turn of the screw will always arrest it. The abdominal wall is stitched up so as to adapt the peritoneum as closely as possible round the pedicle (*see* Fig. 209). It is generally advisable to tighten the wire the day after the operation, to ensure sloughing of the distal part of the pedicle.

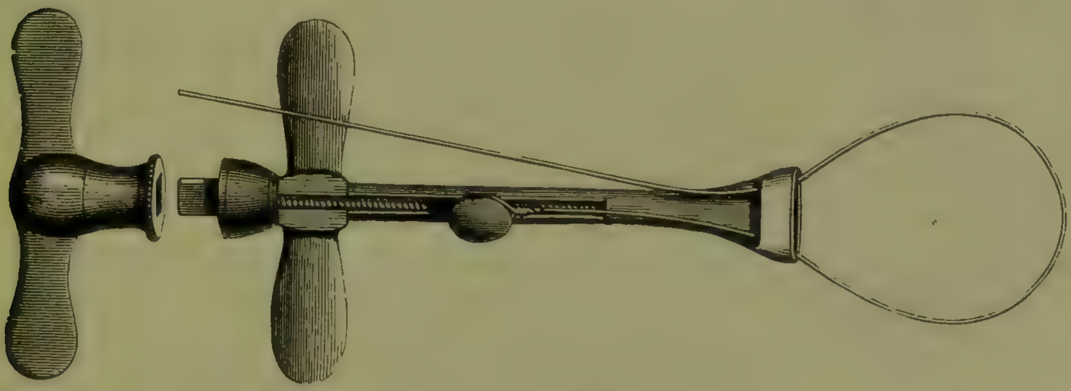

Fig. 208.—Koeberle's Serre-nœud.

It was an improvement in this operation to place a temporary wire or elastic ligature, divide the peritoneum transversely two inches above it, and strip it down; then to place the permanent wire between the separated peritoneum and the pedicle, and stitch the former to the parietal peritoneum. Failing this, a single ligature just above the pedicle, uniting the two sides of the parietal peritoneum to the peritoneum of the pedicle below the wire or elastic ligature (*see* Fig. 209), is of use.

The implements for the operation can be improvised by two knitting-needles and a piece of rubber drainage-tubing for an elastic ligature. In Fig. 209 is shown the fixation of the pedicle in the abdominal wall by elastic ligatures according to Hegar's method.

Application of the Continuous Electrical Current.—Electricity has been used in two ways for the treatment of fibroid tumours. First, a current may be passed through the uterus by an electrode introduced into the interior. Secondly, electrolysis may be produced by puncturing with needles, the negative pole being used for insertion into the tumour. The method of using powerful continuous currents has been perfected by Apostoli, of Paris, who found that, by using a mass of wet potter's clay, folded in large-meshed tarlatan, for the external electrode, a more powerful current could be applied, without injury to the skin. For relief of hæmorrhage a positive electrode of platinum is passed into the uterus, the portion lying in the vagina being insulated by a sheath of celluloid. A galvanometer must be attached to the apparatus (*see* Fig. 210).

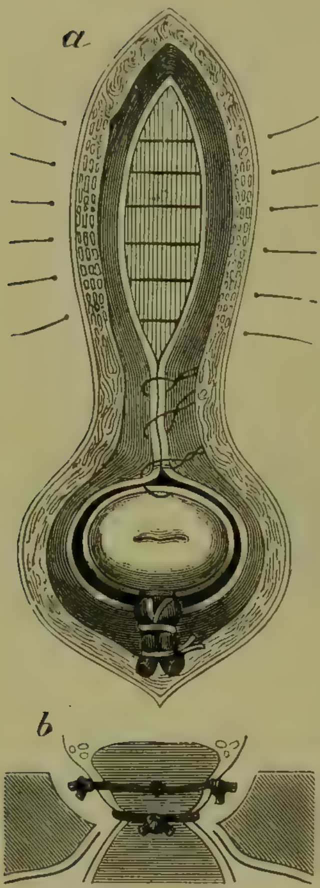

Fig. 209.

Treatment of Pedicle of Fibroid Tumour by Elastic Ligature (after HEGAR and KALTENBACH).

a, Pedicle fixed in abdominal wall, as seen from above. *b*, Pedicle seen in transverse section.

A battery of forty cells is generally used for the production of the current. For a fixed battery Stöhrer's battery, fitted with travelling bridge connections by which two cells at a time may be added to those in use, and particular cells selected for use, seems to be the best. The employment of a rheostat in addition renders the variation of the current still more gradual, and prevents the patient feeling any shock from the change of intensity. Leclanché's battery may also be used, and a portable form of this, weighing about 38 lbs., is made for taking to the patient's house, when the patient cannot come to the battery.

The external electrode is a large plate of copper, embedded in the potter's clay, which should cover the greater part of the abdomen. The internal electrode is a sound of platinum, of which any length desired may be made to protrude beyond an insulating sheath, by which the vagina and cervix are protected (Fig. 211, p. 410). Apostoli uses also an electrode, having a thick carbon terminal $\frac{3}{4}$-in. long, for greater condensation of the current. Electrodes having a thick platinum tip of similar length, the rest of the sound being insulated, are also used for the same purpose. In general the positive pole is first used internally, for relief of hæmorrhage and pain. Later, the negative pole, which has the more powerful caustic effect, may be used internally, with the view of causing reduction of the tumour; but this not unfrequently causes increase of hæmorrhage for the time.

The strength of the current at the first sitting is to be increased from 20 or 30 up to 60 milliampères. Subsequently, an intensity of 100 or 150 milliampères may be arrived at Apostoli himself recommended currents up to 200 or 250 milliampères. The operation may last from four to ten minutes, and may be repeated at intervals of from two to four days, or longer. More recent advocates of the method are content with a current not exceeding 100 milliampères, and advise that the positive pole only be used for the intra-uterine electrode. For a current of this strength, it is not absolutely necessary to use the potter's clay electrode. Instead of it may be used a napkin or double fold of flannel about ten inches in diameter, on which is placed an oval disc of copper connected with the pole of the battery.

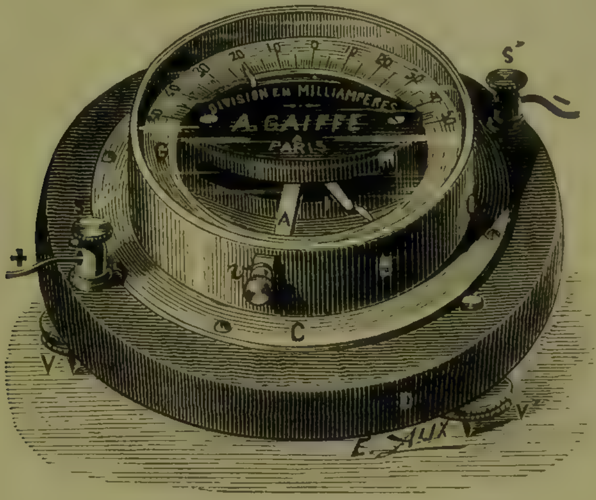

Fig. 210.—Gaiffe's Galvanometer.

This mode of treatment is adapted only to cases in which the cavity of the uterus is readily accessible to the sound. When this is not the case, Apostoli adopts the plan of puncture with a negative electrode of steel. Electrolysis by puncture appears to effect diminution of the tumour only by causing disintegration and inflammation in it. It involves an even greater risk of setting up sloughing of the tumour than the intra-uterine application of the electrode. If the method of puncture is used at all, the electrode for puncture should be insulated up to about half an inch from the point, the insulating sheath passing through the vaginal roof, so that only the interior of the tumour is electrolysed, and not the puncture in the vagina.

It is claimed by the advocates of this treatment that it generally relieves or cures the symptom of hæmorrhage; that occasionally small tumours have entirely disappeared after its use, and that some reduction is obtained even of larger tumours.

The general experience is that the expectations raised by the enthusiastic advocates of electricity have not been fulfilled. In the case of large tumours, often no reduction can be obtained, and rarely more reduction than may be observed after the use of ergot, or other treatment. I have known tumours to go on growing steadily, and causing increased hæmorrhage, in spite of very persevering use of electricity by its most noted advocates.

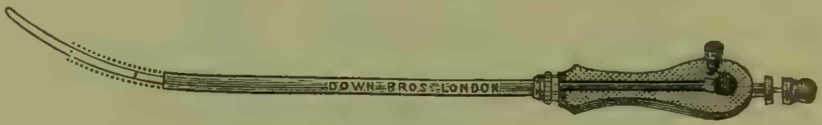

Fig. 211.
Apostoli's Uterine Electrode, modified by Inglis Parsons.

It is alleged, indeed, that intra-polar electrolysis of the elements of the tumour takes place; but it is probable that the effect is rather that of cauterization at the pole, combined with stimulus to contraction when the current is applied. For, in the case of chemical fluids, electrolysis takes place at the poles alone, not between them; and there seems to be no sufficient proof that the case can be different with the tissues of the body. If electrolysis can be relied upon to reduce a tumour, say by one-tenth of its bulk, it would seem that a sufficient number of repetitions of the process ought to remove it almost entirely; and this is admitted not to be the case.

Death has sometimes occurred after the use of electricity, from sloughing of the tumour and septicæmia; and there is a possibility that the use of the current may set up endometritis, and thence produce perimetritis, and peritoneal adhesions about the tubes. Most operators who have performed hysterectomy after the use of Apostoli's electrical treatment agree that the treatment appears to set up peritoneal adhesions. The effect of the current is very powerful. In one instance an assistant of mine allowed the edge of the copper plate to touch the skin for a minute or two, and a wound was burnt in the skin which took three weeks to heal. It is not wonderful that microbic inflammation may occur of a severe burn in the inside of the uterus, and that the inflammation may extend along the tubes to the peritoneum.

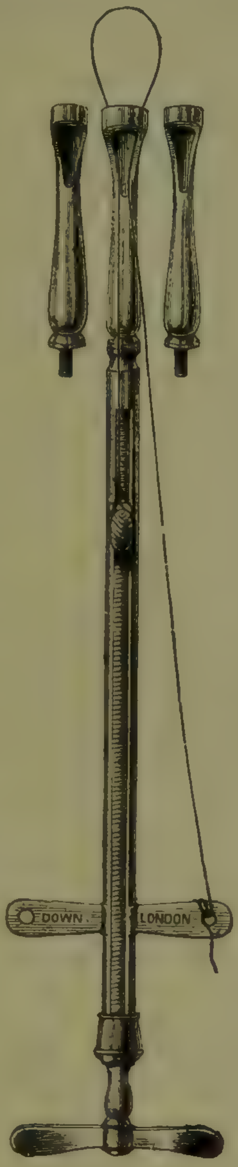

Fig. 212.—Wire Écraseur.

Now that the risk of the far more effectual treatment by hysterectomy is so slight, it appears unadvisable to employ a treatment which is likely to render that operation, if performed later, more dangerous.

Treatment of Fibroid Polypi.—Fibroid polypi may be cut away with scissors, without risk of serious hæmorrhage, if the pedicle can be reached. But the use of the écraseur often allows the pedicle to be divided closer to its origin, if the polypus grows, as it generally does, from the body of the uterus, since the wire loop can be gradually reduced, and slipped up within the cervical canal. It also reduces the hæmorrhage to a minimum.

The écraseur itself, and the thickness of the wire, should be in accordance with the size of the polypus. It is convenient to have an instrument with a very strong stem, into which terminals of various sizes can be screwed (Fig. 212). The écraseur may be used either with the wire-rope made up of several strands of wire twisted, or with a single wire. The single steel wire is preferable, since it is much the stronger. The wire may have a loop at both ends, to be attached to the travelling button, or one end may be left free, to be attached to the crossbar as shown in the figure. This plan is preferable in the case of a large tumour, where there is much difficulty in adjustment. When the polypus has passed through the os, the application of the noose is generally easy, and may be managed by the fingers without any speculum. The patient is placed on the left side, and the stem of the écraseur passed up in front of the polypus. The wire should be stiff enough for the loop easily to retain its shape and position. After the loop has passed over the equator of the polypus, it is gradually reduced as the end of the écraseur is pushed farther up.

The tip of the stem should eventually be passed up within the cervix, and the slack part of the wire drawn in, if the loop is at one end only, before it is finally attached to the transverse bar of the écraseur, the loop having been previously secured to the travelling button. If both ends of the wire loop have been attached to the travelling button, the écraseur must be partially screwed up as the loop is pushed on into position around the pedicle. If a small portion of the pedicle is left, it shrinks up after removal of the main growth. An anæsthetic should not be given for this operation, if it is possible to avoid it, for dividing the pedicle of the polypus gives little or no pain, while pain is severe if the uterine wall be included in the loop, and thus an error may be revealed at the last moment.

In the case of a very large polypus filling the vagina it may be impossible to reach the pedicle, or be certain whether the tumour has a pedicle, or a broad attachment. But if the loop is once passed over the equator of the tumour, it can be slipped up to the neck of it. In such case, a strong steel wire, such as piano-wire, should be used, capable of cutting through a firm base. If any of the tumour remain after the first application, the écraseur may be applied a second time. If a polypus is very large, difficulty may arise in its extraction, after division of the pedicle. In the absence of forceps specially constructed for the purpose, delivery may sometimes be effected by midwifery forceps, or, preferably, by passing the loop of the écraseur again over the polypus, and so dividing it into pieces. If this cannot be accomplished readily, the tumour may often be extracted, without laceration of the vulva, by the following plan. The portion presenting at the vulva is seized by strong tenaculum forceps, and an incision is made with scissors in the tumour in a spiral form, commencing near the point where it is seized, while traction upon the tenaculum is meanwhile maintained. In this way the tumour is gradually elongated and drawn through the vulva.

If the polypus is within the uterus, the cervix must be fully dilated before removal is attempted. In order to pass the loop of an écraseur over an intra-uterine polypus, it is desirable to depress the uterus as much as possible, by drawing down the anterior lip of the os with tenaculum forceps, while an assistant presses it down from above. It is often useful to fix a tenaculum in the polypus itself, make some traction by its means, and then pass the loop over the handle. Care must be taken, however, not to produce in this way partial inversion of the uterus, and the traction should therefore be relaxed before the écraseur is tightened.

Polypoid elongations growing from the os are easily removed by the écraseur, or, if their base is broad, they may be amputated by the plastic method, and the bleeding arrested by sutures.

CANCER OF THE CERVIX UTERI.

Causation.—Cancer of the neck of the uterus is a very common disease. It is more frequent even than cancer of the breast, and is the chief cause of the greater prevalence of cancer in the female than in the male sex. It most commonly occurs between the ages of forty and fifty, but a considerable proportion of cases is also met with between thirty and forty, while a few appear before the age of thirty, and others occur even up to advanced old age. Cancer of the cervix is extremely rare in virgins, and much commoner among parous than among nulliparous women, while among the subjects of it a considerable number of women are found who have had large families. Thus, in an analysis of 100 consecutive cases by Haultain, there was only one unmarried woman (aged fifty-two), and she was suffering from sarcoma. There was not a barren woman among the number. Seventy women, of whose cases the record was sufficiently full for the present purpose, had borne 412 children and had 68 abortions. Thus the average number of pregnancies was about 6·8.

From this it may be inferred that inflammation of the cervix, induced by parturition or other mechanical causes, plays an important part in the causation of cancer, and that the so-called erosion or granular inflammation near the os, or within the cervical canal, may eventually, *in predisposed subjects*, go on to malignant degeneration, although in any given case of this common affection such a termination is an improbable one. This view is confirmed by the researches of Ruge and Veit (*see* p. 192), who found that in so-called erosion a gland-proliferation takes place, and that cancer may commence with a similar proliferation, with the addition of an exuberant growth of epithelium partially or wholly filling up the acini.

Laceration of the cervix may thus predispose to cancer, by giving rise to inflammatory irritation of the exposed mucous membrane of the cervical canal. I have several times observed cancer supervene upon a chronic laceration, with granular inflammation, of the cervix not actively treated; but have never known it to occur after such a cervix had been treated by plastic operation. At a very early stage of cancer, it is not uncommon to find evidence of a pre-existing laceration (*see* Fig. 217, p. 425, in which the cervix appears to have a bilateral split, deepest, as usual, on the left side). That constitutional predisposition is also an important element in the origin of cancer of the cervix is shown by the comparative immunity of negroes, though it is not to be inferred from this that the disease may not be purely local at its commencement. Predisposition to cancer in individual families has also some influence, although it is only in a minority of cases that a history of this can be traced. As in the case of tuberculosis, what is inherited is merely a deficient resisting power; and those who are liable to tubercle are often liable also to cancer in later years of life.

As in the case of cancer in general, predisposing causes are supposed to be the hardships of life, and especially mental anxiety or bereavement.

Pathological Varieties.—There are three tissues in the cervix from which malignant disease may arise. (1) From the proliferation of the epithelium of glands, either primarily existing within the cervical canal, or formed by ingrowth of cylindrical epithelium into depressions under the influence of irritation, may arise true carcinoma. Glandular carcinoma may begin by a simple exuberant proliferation of the glands, but it is seldom that the cancer is detected early enough for histological examination at this stage. Soon a departure occurs from the normal glandular arrangement by the proliferation of the epithelium into masses, many cells deep, which project into or occlude the lumen of the gland. Next, similar masses of cells invade the cellular tissue, so that solid masses are seen in it, without any lumen, and not enclosed by any glandular membrane. In the cervix uteri the growth does not long retain the definitely glandular type which is seen in the cylindroid carcinoma or adenocarcinoma of intestine or of the body of the uterus. Even in an early case, it is generally only here and there that a piece of nearly normal gland epithelium, or glandular lumen, can be seen, to indicate the mode of origin of the growth. The main part of it is made up of cemented cell-masses without any glandular lumen. In many cases such masses alone can be seen, and the diagnosis from squamous epithelioma is made mainly by the shape of the cells approximating more to the columnar than to the usual squamous type. At this stage the growth is called a columnar-celled epithelioma.

The cells, however, vary considerably from the typical columnar form, and may have multiple nuclei, indicating rapid proliferation. Often they form columns, with the long axis of the cells arranged at right angles to the axis of the column. The cells of squamous epithelioma may also vary considerably from the type, and sometimes become elongated, perhaps from pressure. In advanced cases, therefore, it is not always possible to say with certainty whether a growth began from glands or from the squamous epithelium. The extent to which the character of the epithelium forming the masses of carcinoma may undergo change is illustrated by the fact that a keratinizing form of carcinoma, in which epithelial globes are formed, has occasionally been observed in the fundus uteri, where it can only have originated from glandular and not from squamous epithelium.

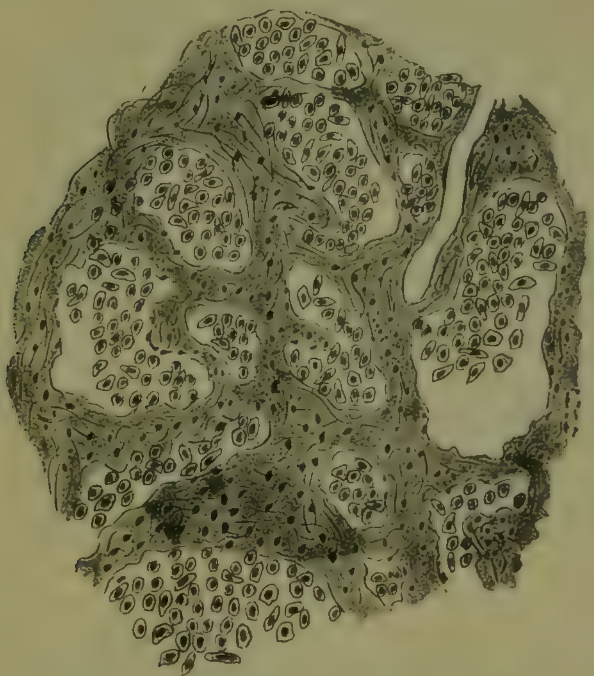

Fig. 213.—Carcinoma of Cervix Uteri.

From the first there is a rapid proliferation of the stroma around the cell-masses by the growth of small round cells. A further development of the growth is the infection of this stroma by the appearance in it, in ones, twos, threes, or in groups, of large cells similar to those of the epithelial masses, but now probably far removed from the type of normal columnar epithelium. At this stage the cells are no longer cemented together. In this way is effected a transformation to the type of growth which satisfies the definition of true carcinoma, namely, one consisting of groups of epithelium-like cells, not cemented in masses, but grouped in alveoli, with no intercellular substance between the cells. (*See* Fig. 213, p. 415.)

If the infiltration is by cells not in large groups, but only two or three together, or even single, the epithelium-like cells may seem to have an intercellular stroma; and thus the structure of some parts of the growth may correspond to the definition rather of sarcoma than of carcinoma. A diagnosis of its true nature can only be made by examining different parts and studying the character of the individual cells.

Carcinoma in the cervix varies considerably in hardness, according to the relative proportion of cells and fibrous stroma, but approximates rather to medullary than to scirrhous carcinoma. A true scirrhous carcinoma, in which the fibrous stroma largely preponderates over the included cells, is very rarely found in the cervix. Carcinoma of the cervix, commencing from the glands, commonly begins just within the os, near the junction between squamous and cylindrical epithelium. More rarely it arises higher up in the cervical canal, constituting a carcinoma of the cervical canal, which is apt to be insidious in its course, and to escape discovery until it has reached the cellular tissue outside the cervix. Glandular carcinoma does not tend so much as epithelioma to form an outgrowth into the vagina, but rather an infiltrating and subsequently ulcerating form of disease.

(2) From the ingrowth of processes of the deeper layer of the squamous epithelium originates, in the first instance, a squamous-celled epithelioma. This usually forms a growth enlarging the cervix, and projecting into the vagina. Like glandular carcinoma, it generally begins near the junction with columnar epithelium. The most regular type of squamous-celled epithelioma, in its earlier stage, is shown in Fig. 214.

Epithelioma of the cervix differs, however, from the ordinary epithelioma of the skin in many important respects. *First*, the epithelial globes, so characteristic of epithelioma of the skin, are rarely seen, and that only at an early stage of the growth. *Secondly*, the cell-masses proliferate much more rapidly, and hence the disease runs a more rapid course. Sometimes the cell-masses constitute almost the whole growth, the connective tissue stroma being represented only by delicate trabeculæ passing amongst them and carrying the vessels. Such a growth can be broken down readily by the fingers. *Thirdly*, the cells themselves alter their character and no longer resemble regular squamous epithelium. They become very various in size and shape, may cease to be regularly cemented together, and often appear to be propagating by division, or to have multiple nuclei within them. Some of these included bodies may be coccidia. *Fourthly*, there is not merely a small-celled infiltration of the surrounding connective tissue, as in skin epithelioma, but the connective-tissue stroma takes on an active growth of an embryonic character, as if it, as well as the cell-masses, were infected by malignancy. It may form a considerable share of the growing mass, and I have found, in some instances, that the connective-tissue stroma was so soft that, in a thin section, it fell out, leaving a framework of cell-masses. In most forms of cancer, it is more usual for the cell-masses to fall out, leaving the fibrous trabeculæ. *Fifthly*, the growth does not merely advance by the inward growth of columns of cell-masses, but the stroma around the growing border becomes infected, and fresh centres of cancer spring up in it.

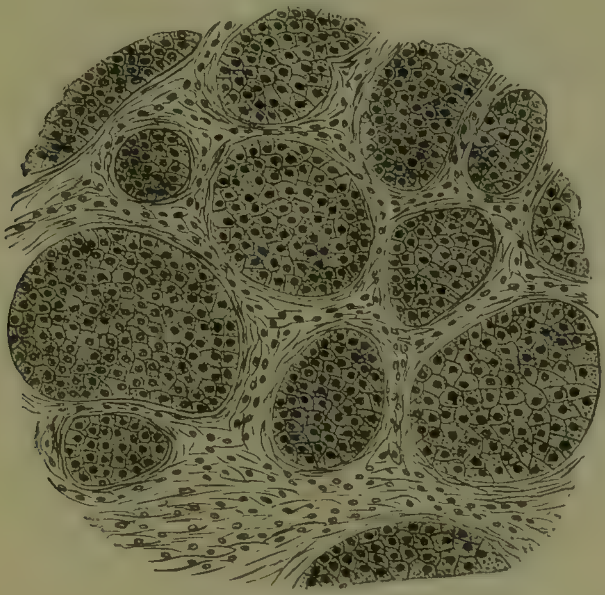

Fig. 214.
Squamous-celled Epithelioma of Cervix Uteri.

Thus, sections perpendicular to the surface show generally rounded rather than columnar cell-masses, even at an early stage. Later, the whole appearance of the growth becomes altered by this process. Around the growing border may be seen small clusters of cells, with large nuclei like those of the epithelial masses, isolated in the stroma. As these clusters enlarge, especially if the cells have ceased to be cemented, the growth corresponds to the definition rather of carcinoma than of epithelioma, consisting of small clusters of uncemented cells in alveoli of connective tissue. Thus, in an advanced stage, it is often impossible to say whether the growth began from squamous epithelium or from glands.

A yet further stage may sometimes be reached, in which the cancer cells become so intermingled with the stroma, that intercellular substance appears to pervade and isolate them all. As in the case of an originally columnar-celled epithelioma, parts of the growth may then be found, which, taken by themselves, correspond to the definition of sarcoma rather than of carcinoma, or differ from it only by the epithelium-like appearance of the cells, and their large nuclei. As a rule, these large nuclei distinguish the carcinoma cells from those of the stroma, which have smaller nuclei, even if the stroma is growing so rapidly as to be round-celled. It is uncertain whether the infection of the stroma takes place by migration of the carcinoma cells, by progressive infection by a parasite of cancer apart from cells, or

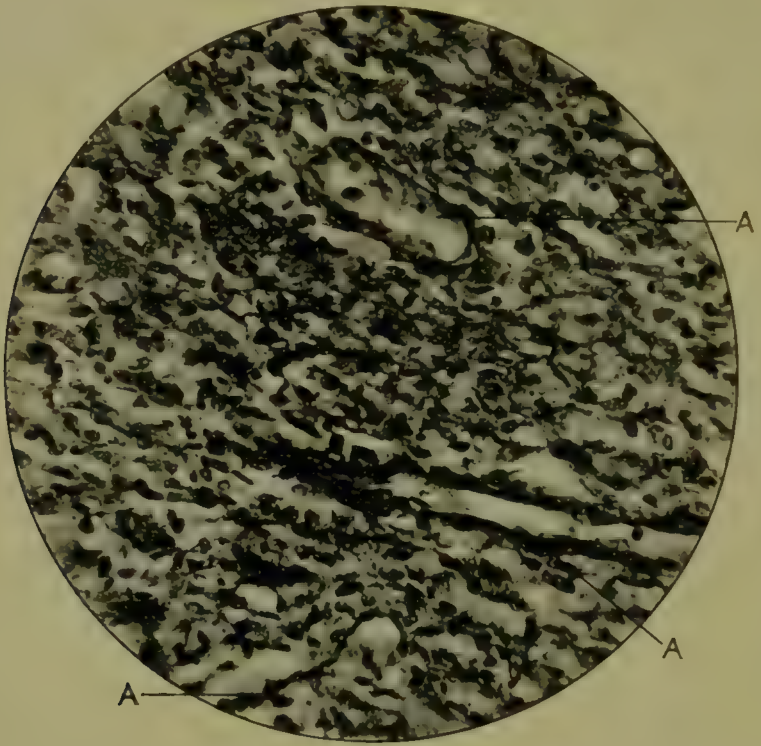

Fig. 215.—Sarcoma of Cervix Uteri.
A, sections of vessels.
(Micro-photograph by Dr. E. S. Worrall.)

by a kind of spermatic influence affecting the nuclei of the connective tissue and causing them to grow into the likeness of the carcinoma cells, or by two or more of these processes together.

(3) From the connective tissue of the cervix may originate sarcoma, which is the rarest form of malignant disease in the cervix, constituting less than one-tenth of the whole number of cases. It may be either round-celled or spindle-celled. Round-celled sarcoma may form a growth which can only be distinguished from epithelioma or carcinoma by the microscope. The structure of such a case is shown in Fig. 215. It consists of round or angular nuclear cells, united by processes. The characteristic thin-walled vessels (A) will be noted. Spindle-celled sarcoma forms a harder mass, of slower growth, and less liable to ulcerate and bleed. It is liable to be mistaken for myoma.

If cancer of the cervix occurs under the age of twenty, or even shortly after that age, it is almost certain to be sarcoma. It may form a papillary grape-like growth, like nasal polypi, but more friable, and have the structure of myxo-sarcoma. In one instance, I found cartilage in the original growth. It is highly malignant, spreads to the interior of the uterus, recurs quickly, and kills in a short time.

Clinical Varieties.—The main distinction is between growths which form proliferating tumours projecting into the vagina, and those which infiltrate surrounding tissues and ulcerate early, producing excavated or conical ulcers, having a hard border of growth, which at first may be in the tissue of the cervix itself, but later involves surrounding parts, vagina and bladder. As a general rule the proliferating growths are squamous epithelioma in the first instance, the ulcerating growth columnar-celled epithelioma or glandular carcinoma; but this rule is not invariable. In any case a stage supervenes sooner or later in which ulceration predominates.

Of the proliferating growths, those which enlarge the extremity of the cervix uniformly convert it into a mushroom-like shape with everted edges. Those which grow irregularly have rather a cauliflower-like appearance. The term *cauliflower excrescence* was, however, originally not applied to all of these, but limited to a sprouting papillary growth, readily bleeding, capable of being broken down by the fingers, and so soft that after its removal or after death nothing but a broken-down pulpy mass, like macerated placenta, might remain. This was regarded by some as a special form of disease, and not necessarily malignant. The papillæ have, however, the structure of squamous epithelioma, consisting mainly of soft cell-masses, with but little connective-tissue stroma, and that very friable and embryonic. But a great tendency to proliferate in papillæ may be associated with but a slight tendency to infiltrate, and hence a growth of this kind may be favourably placed for eradication. Another variety is cancer commencing in the cervical canal, which may affect a considerable portion of the cervix, and even reach the cellular tissue, before it shows itself at all on the vaginal aspect of the cervix. In rare cases the surface either of a fibroid polypus or of a mucous polypus has been found converted into cancer.

Directions of Extension.—The disease usually spreads equally in all directions while it remains in uterine tissue. But as soon as it reaches the softer cellular tissue or the vaginal wall it spreads with much greater rapidity. Hence, in the common case in which it begins close to the external os, one lip of the cervix is commonly enlarged more than the other, and a section of the growth has a shape similar to that shown in Fig. 217, p. 425. The disease extends higher along the cervical canal than it does at the outer part of the cervix, and soon reaches above the level of the vaginal fornices; but it commonly extends to the vagina and the cellular tissue around, before it reaches as high as the internal os. Since both squamous-celled and columnar-celled epithelioma commonly begin close to the place of transition of epithelium, and perhaps originate in the mixed and doubtful epithelium which often exists at that locality in cases of inflammation, there is not the marked distinction of locality described by some authors between cancer of the portio vaginalis and cancer of the cervix. Often only the microscope can distinguish between them. But cancer of the cervical canal, beginning some distance higher up, is markedly distinct, and often insidious. Squamous epithelioma of the outside of the cervix, not involving the external os, is rarely, if ever, seen.

The disease may commence in the cleft of a lacerated cervix, quite near to the vaginal reflection, and, in that case, it reaches the vagina and the cellular tissue at a very early stage. Cancer of the cervical canal extends outward towards the cellular tissue, as well as upward and downward. Generally it reaches the cellular tissue before it passes above the internal os, but sometimes it involves the body of the uterus first. This is especially the case with carcinoma originating in the glands, which sometimes does not spread uniformly from a central point, but affects the mucous membrane for a considerable distance along the canal. In the ulcerating stage, the cervix is eaten away, the vagina and the base of bladder are involved, and the fundus is also reached (Fig. 216). Eventually, vagina, bladder, and rectum may be thrown into one cloaca. The bladder is usually laid open before the rectum.

Metastatic deposits may occur in the pelvic and lumbar glands, ovaries, peritoneum, and also in distant organs, as the lungs and liver, even in the case of spindle-celled sarcoma, the least actively malignant of the various forms of growth. Mr. Arnott found metastatic deposits in the glands in 50 per cent., in other organs in 41 per cent. of his cases, after death from the disease without operation. The glands first affected in carcinoma of the cervix are the hypogastric glands, lying along the course of the internal iliac vessels and near the bifurcation of the common iliac artery. Authorities differ as to whether the obturator glands are liable to be affected.

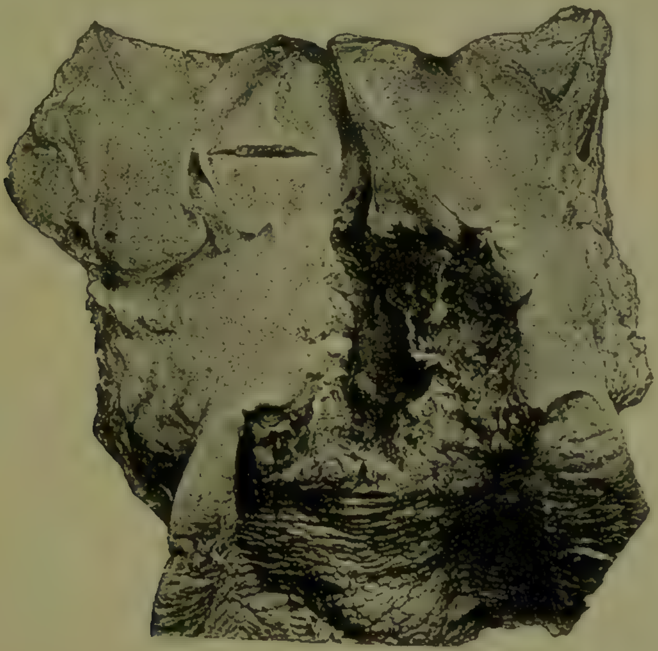

Fig. 216.
Advanced Carcinoma of Cervix Uteri, forming Ulcerated Cavity.
(From a photograph.)

Metastatic deposits sometimes occur on the vaginal wall where it comes in contact with the growth, and especially by infection of any tear or abrasion of vagina or vulva which may be produced in any examination or operation. The growth often interferes with the ureters, leading to wasting or inflammation of the kidneys, and may even entirely occlude them.

Results and Symptoms.—In the early stages of cancer the symptoms are frequently so slight that the disease commonly does not come under observation until it has reached a stage at which it is ineradicable. When an early symptom occurs it is usually that of hæmorrhage, often not profuse, but irregular, and frequently recurring. Hæmorrhage on coitus is not unfrequently the first symptom. Menstruation is also increased, and leucorrhœal discharge is generally present, sometimes slightly tinged with blood. A recurrence of uterine hæmorrhage, after the menopause has for some time passed, should always lead to the suspicion of cancer, and be regarded as an imperative indication for a vaginal examination. Early symptoms are more commonly present in the vegetating than in the infiltrating forms of cancer; in the latter of which there may be no hæmorrhage up to quite a late stage.

Pain is usually absent or slight while the disease is confined to the cervix, and in some cases of soft cancer very little is felt up to quite an advanced period of the disease. In most cases, however, as soon as the growth has infiltrated the tissues round the uterus, severe lancinating pain is a marked feature, and renders cancer of the cervix one of the most terrible of diseases. It may generally be distinguished from the pain of chronic inflammation or engorgement from the fact of its being felt severely at night, and disturbing sleep, while the other is chiefly evoked by standing or locomotion, and is relieved by rest. Pain may be also produced in cancer by the soreness of the ulcerated surface exposed to friction, and when of this nature it may be much relieved after removal or destruction of the diseased surface.

As soon as ulceration has commenced, the discharge has generally a watery character, often tinged with blood, and soon acquires the most intense fœtor, which forms not the least among the sufferings of the unfortunate patient. Frequently shreds of gangrenous tissue come away with it. At the outset the patient may be apparently in the most florid health, but, as soon as the ulcerative stage is reached, cancer of the cervix very quickly induces loss of flesh and the well-known cancerous cachexia. As displayed in this form of cancer it depends, in great measure, upon the effect of repeated hæmorrhages, and upon a constant slight sapric absorption from the foul discharges. Thus a great improvement may be effected in the general appearance by partial removal of the growth, leading to a temporary cessation of hæmorrhage and fœtid discharge.

The cachexia shows itself mainly in a sallow, yellowish tint of skin, accompanied by emaciation, but this does not present anything absolutely characteristic; and a very similar appearance may be seen in other cases, especially in those of fibroid tumour or polypus, accompanied by hæmorrhage and sloughing. Digestive functions are impeded, and nausea and vomiting are frequent, being partly the effect of the disgusting smell of the discharge. Obstinate constipation may result from mechanical interference with the rectum, while occasional attacks of diarrhœa from reflex irritation are not unfrequent. Disturbance of the bladder occurs pretty early, and may be the first symptom which attracts attention. At first there may be reflex tenesmus, then difficulty of micturition as the base of the bladder and the urethra become involved, and finally incontinence, from the existence of a fistulous opening.

The duration of the disease commonly varies from one to two years after the recognition of its character; more rarely the patient survives for three or four, or even a greater number of years. Very rare instances have been recorded in which an apparent spontaneous cure has resulted after sloughing of the growth. The growth may be eradicated by operation, if performed early enough. Even if it recurs, a respite may be obtained for one or two years, or even longer. Death occurs sometimes directly from hæmorrhage, but more frequently from gradual exhaustion and emaciation, aided not unfrequently by the effects of uræmia or kidney inflammation, set up by the interference of the growth with the bladder or ureters. Intercurrent peritonitis or pneumonia may close the scene, or death may occur rapidly from occlusion of the ureters, producing complete suppression of urine, or suddenly from pulmonary embolism, usually the sequel of thrombosis of the pelvic veins in or near the growth.

Diagnosis.—When the disease has reached the ineradicable stage the diagnosis should be easy, although mistakes have not unfrequently been made. The cervix is fixed, and dense inelastic induration may extend to the vaginal walls. In the hard mass is felt an ulcerated cavity with hard nodular edges. Its surface gives to the finger a peculiar sensation of superficial friable softness, with extreme inelasticity of the tissue beneath. The fixation of the uterus can generally be best estimated by rectal examination, especially if the cervix has been destroyed by ulceration. By this means, the infiltration may be felt extending along the utero-sacral and broad ligaments to the pelvic wall.

Hæmorrhage is generally produced by touching the surface of the ulcer. The fœtor of the discharge is a ready diagnostic sign in the later stages. In endometritis or vaginitis the discharge may be offensive enough to annoy the patient, but the intense and nauseating smell, hardly to be removed from the fingers even by disinfectants, belongs only to cancer, and to the decomposition of the products of conception, or the sloughing of a benign tumour, such as a fibroid or polypus. The two latter conditions can usually be easily distinguished by the history and physical signs. A very foul smell may also be produced by a neglected pessary. The absence of fœtor is no disproof of cancer.

In the proliferating forms of cancer the growth often attains considerable size before the cervix becomes fixed. There is then an unequal enlargement of one or both lips of the cervix, not nearly so hard to the touch as chronic hyperplasia. The surface is more or less villous or papillary, and readily bleeds on manipulation. The whole cervix is broadened, and tends to grow into a mushroom-like shape, with eversion of its edges—a valuable diagnostic sign. By speculum a bulging, irregular, mottled, deep-red surface of more or less extent is seen, which is destitute of the normal squamous epithelium, and may have excavated ulcers on its surface. The speculum, however, should be used with great caution in cases of cancer of the cervix, on account of the severe hæmorrhage which it may induce. When it is required for diagnosis, or the application of remedies, it is usually best to employ either a Sims' (Fig. 36, p. 50) or Neugebauer's speculum (Fig. 40, p. 51), the first blade of which can be guided past the cervix by the finger. Nothing but the microscope can absolutely decide whether the growth is carcinoma or epithelioma, since both may have a papillary or villous surface. But, as a rule, a prominent or papillary growth has begun as a squamous epithelioma. The exceedingly friable, villous, readily-bleeding surface of the true cauliflower excrescence can scarcely be mistaken for any other condition.

The first difficulty in the diagnosis of cancer in the remediable stage is the neglect of patients to come for examination. There is a too prevalent idea among women that an abnormal sanguineous discharge is sufficiently explained by the change of life. Even medical men sometimes fail to insist on an examination when suspicious symptoms are present. It should be an invariable rule that *in married women, and especially women who have borne children, any sanguineous discharge apart from menstruation, or any other unusual discharge, should be an indication for local examination.* If a sanguineous discharge begins after the menopause has been fully established, the indication is still more urgent. In such cases, cancer is found more frequently than any other cause.

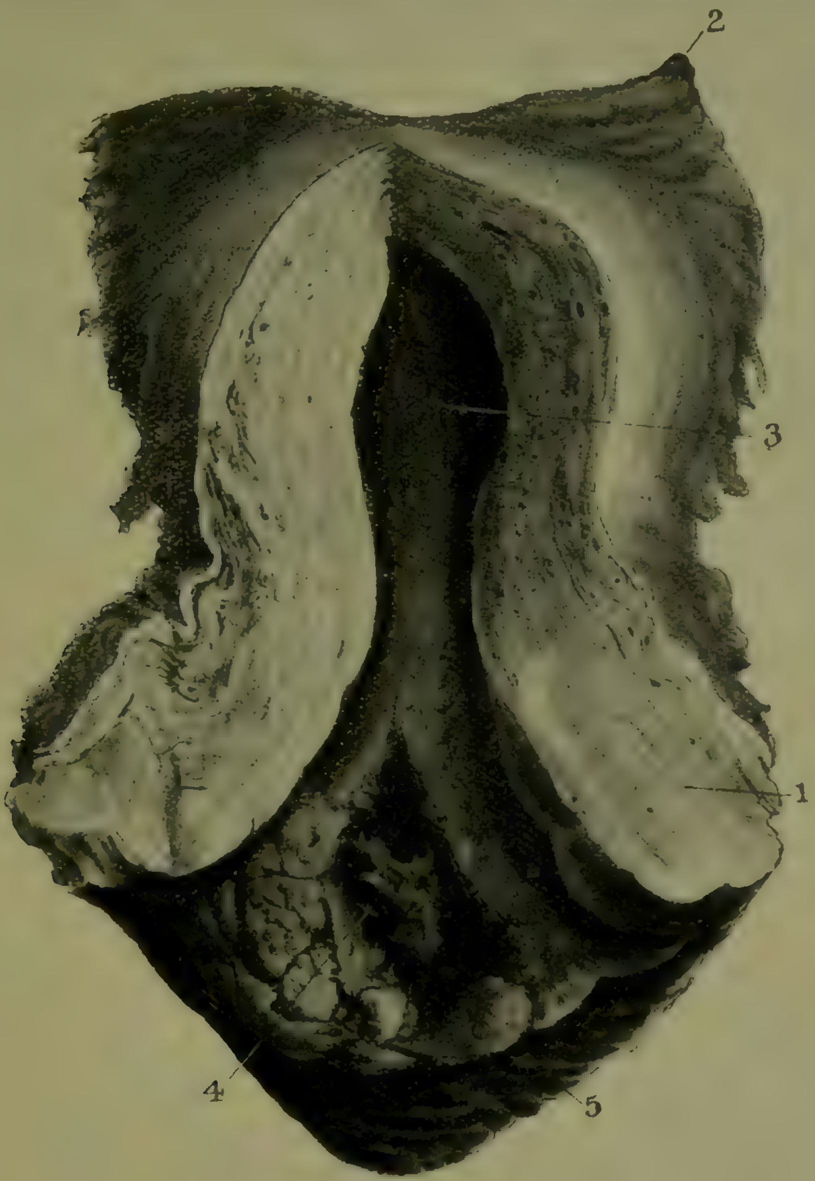

Fig. 217.
Uterus with Cancer of the Cervix at an early stage.

A uterus laid open from behind, showing an ulcer on the anterior wall of the cervix. It has a raised edge, and the surface is covered with shreds of sloughing tissue. Microscopically it is a columnar-celled carcinoma. It was removed by vaginal hysterectomy from a woman of fifty-four. 1, Posterior portion of the cervix; 2, Fallopian tube; 3, cavity of body of the uterus; 4, surface of cancerous ulcer on anterior wall of the cervix; 5, vagina.

From Hubert Roberts' "Outlines of Gynæcological Pathology," Fig. 117.)

Even in unmarried women, an immediate local examination is imperative.

The diagnosis of the earliest stage of cancer may be one of difficulty. The most valuable assistance is to be found in the fact that it usually commences *on the surface* near the os, or just within the cervical canal, and is associated with some degree of papillary growth, which leads to ready hæmorrhage on manipulation. If bleeding is produced by a gentle touch of the os by the finger, and not merely by rough handling, or the use of the speculum or sound, the suspicion of commencing cancer should be excited, especially if any papillary surface or inelastic nodules are felt around the os. Villous erosions, however, may also sometimes readily bleed, and in a very doubtful case the only certain method of distinguishing is to remove a portion of tissue by scissors or sharp spoon, and examine it microscopically. For any certain conclusion the fragment should be large enough to allow it to be hardened, and sections cut from it.

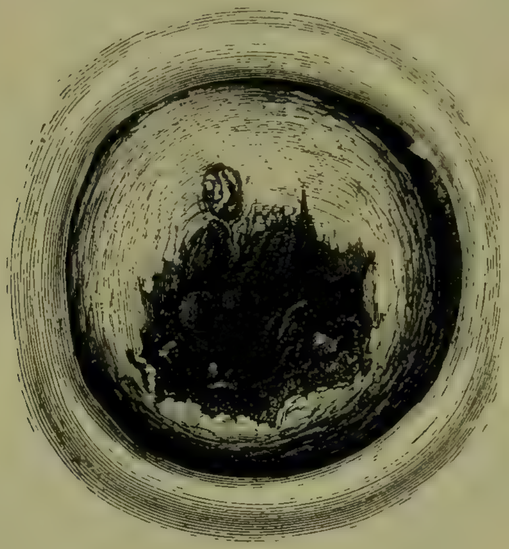

Fig. 218.—Cancer of the Cervix Uteri at a very early stage. (After Ruge and Veit.)

As seen through a speculum, cancer, at a very early stage, may sometimes be distinguished from any non-malignant ulceration or erosion by the presence of limited irregular prominences, which may be separate from the cervical canal, having a deep-red and papillary or villous surface. There may also be an excavated ulceration, with sharply cut edge, near the margin of the os, extending either inwardly toward the cervical canal, or outwardly over the cervical portion, or both (*see* Fig. 218). Figs. 217 and 218, showing an early stage of cancer, may be compared with

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Fig. 112, p. 201, and Fig. 113, p. 202, showing granular inflammation with laceration, and simple erosion, respectively.

Hyperplastic induration of the cervix has, formerly, often been mistaken for cancer. It may be distinguished by the fact that the cervix is movable (unless fixed by inflammation); its irregularity is due to fissures radiating from the os, or to hypertrophy of the ridges of the *arbor vitæ*, and its tissue has some elasticity with its hardness, while pain is usually increased during the menstrual flow, instead of being relieved by hæmorrhage, as is commonly the case in cancer. Generally, also, there is no irregular hæmorrhage, nor is there usually hæmorrhage on gentle manipulation, unless a severe erosion exists. In hyperplasia there is commonly a history of symptoms referable to uterine disorder of many years' duration, while the symptoms of early cancer are not likely to have existed many months. It is to be remembered, however, that cancer may supervene upon disease of a non-malignant kind. The tissue of an inflamed cervix is too tough to be scooped out by a sharp spoon in any piece large enough for microscopic section. Only the superficial epithelium can be scraped off. If, therefore, any place can be found on the suspicious surface from which a piece of tissue can be scooped out, the presumption is in favour of cancer. If none such can be found, the presumption is against it. Occasionally, however, cases occur of the infiltrating form of cancer in which a piece suitable for examination can only be snipped out with scissors.

Treatment.—If the disease is recognized before the uterus is fixed, no time should be lost in attempting to eradicate it by removal. Even though it may recur, the patient is relieved for a considerable period from hæmorrhage and discharge, and the course of the disease is much protracted.

If there is extension of the cancer to the cellular tissue, fixing the uterus to the pelvic wall, no operation for eradication should be attempted. There may, however, be a limitation of mobility of the uterus, or a partial fixation, generally on one side, due to old cellulitis. This is the more likely, since a deep split of the cervix is often associated with a cicatricial band in the cellular tissue; and a lacerated cervix probably predisposes to cancer. Such a fixation is not a bar to operation, but renders the uterus more difficult to pull down. It is generally distinguished from cancerous infiltration by the fixation not being absolute, and by the thickening not being nodular. In case of doubt, the operation may be attempted.

Extension of the cancer to the vaginal wall, if limited, and metastases in the vagina, if capable of excision, are not an absolute bar to the operation, but render the chance of permanent cure much more remote. The same is true of extension to the cellular tissue at the side of the uterus, if it is not a diffuse infiltration and does not extend to the position of the ureters. In the excision of such an extension, whether in the vaginal wall at the side of uterus, or in the cellular tissue beneath, there will probably be no room to place clamps or ligatures between the ureters and the growth. It is best to excise the growth at once, and place pressure forceps or separate ligatures on any arteries which bleed. Even an extension to the bladder, limited to the front of the cervix, may be excised with a portion of the bladder wall.

The operations for eradication of cancer of the cervix uteri have undergone a progressive evolution in thoroughness. At first the cervix was amputated with the steel-wire or galvanic écraseur at the level of the vaginal reflection. But, even at an early stage, a cancer beginning near the external os will generally have run up the cervical canal above the level of the vaginal reflection, as shown in Fig. 226, p. 442. By this operation, therefore, a manifest portion of the cancer was generally left behind.

Marion Sims then introduced the plan of excising the cancerous cervix piecemeal, and applying a strong caustic, such as chloride of zinc, afterwards. This plan was superseded by supra-vaginal amputation of the cervix, by which operation the whole cervix was excised up to or somewhat above the position of the internal os, the peritoneal cavity not being opened. Now almost all operators prefer vaginal hysterectomy to this operation. Some operators go still further and choose the abdominal route, with the view of following up and excising all lymphatic tracks and lymphatic glands which are liable to be infected, as is done in the case of cancer of the breast, tongue, and other organs. This more extensive operation has not yet been accepted as advisable in all cases of cancer of the cervix, and vaginal hysterectomy is still the operation more frequently chosen.

In the comparison of vaginal hysterectomy with supra-vaginal amputation of the cervix, the former operation is sometimes recommended on the ground that it is advisable, as in the case of the breast, to remove the whole of the organ affected by cancer. The case of the cervix uteri, however, is not strictly comparable with that of the breast, for the cervix uteri is distinct in function from the fundus uteri. Moreover, cancer of the cervix has not a special tendency to spread to the fundus more readily than to other parts; on the contrary, it is held by some that its tendency to spread outward to the cellular tissue or downward to the vagina is greater.

The reasons why vaginal hysterectomy is to be preferred, as a rule, to supra-vaginal amputation of the cervix are the following. The risk of the operation is now not appreciably greater than that of supra-vaginal amputation in the hands of a skilful operator. The operation itself is in some respects more straightforward, since both uterine and ovarian arteries are secured outside the uterus, and bleeding is thus effectually checked. In supra-vaginal amputation, on the other hand, the uterine arteries are secured, but not the ovarian. Even in early cases of cancer, it is not always possible to tell with certainty whether the disease began near the external os, or higher within the cervical canal, or to what extent it may have spread up the cervical canal. It may sometimes happen, therefore, that the growth is found unexpectedly to have spread within the internal os, and above the level of section in supra-vaginal hysterectomy. Supra-vaginal amputation of the cervix has also the disadvantage that it is followed by contraction of the canal left in the cellular tissue by removal of the cervix. Especially in women who have not reached the menopause, there may result from this dysmenorrhœa, and sometimes hæmatometra from retention of menstrual fluid. Even after the menopause, there may be retention of secretion from almost complete closure of the canal, leading often to pyometra, the contents of the uterus being purulent and offensive, and perhaps occasionally or continuously escaping *per vaginam*.

Operation of Vaginal Hysterectomy.—The patient is placed in the lithotomy or exaggerated lithotomy position, such as that shown in Fig. 68, p. 80, in front of a good light from a window. This position has the advantage over the Sims' semi-prone position that, if there is any septic discharge from the cancer, it does not tend to gravitate into the peritoneal cavity after the peritoneum is incised. The vulva is shaved, and the peritoneum retracted by a modified Sims' speculum with a short blade, as broad as the vagina will conveniently admit (*see* Fig. 38, p. 50.) Five or six short straight vulsella, of the pattern shown in Fig. 26, p. 40, should be provided. These, when closed, have no projecting points by which the fingers could be scratched.

In parous women, not much past the menopause, the vagina generally allows room enough for the operation. If there is senile atrophy of the vagina, however, especially in the case of elderly virgins, more room must be obtained. For this purpose an incision may be made at the side of the perineum into the ischial fossa on one or both sides. If the whole vagina is narrow it may be necessary to extend the incision the whole length of the vagina. Some operators, with a view to a more thorough operation, extend the excision backward nearly to the sacrum, carrying it around the rectum. This, however, is not generally necessary. Any arteries which bleed on the incised surface are tied with catgut; and after the operation the incision or incisions are sewn up, with catgut for the vagina, and silkworm gut for the perineum. The perineal sutures only have to be removed.

As a preliminary to the operation, precautions should be taken to remove both septic material and tissue likely to cause local cancerous infection during the operation; since it is probable that many recurrences are due to cancerous infection of the cut surfaces. Any sloughy surface or any projecting soft growth should be scraped away or cut away with scissors. After this the raw surface should be thoroughly seared with Paquelin's cautery, both to arrest bleeding and to seal up so far as possible the cancerous material. Even in the absence of any prominent growth, if the disease is early and limited, it may be advisable to scrape it away as thoroughly as possible and cauterize the surface, provided that too much of the cervix is not thus removed to allow a good hold of it to be obtained by vulsella. After this the vagina should be thoroughly douched with a powerful antiseptic such as perchloride of mercury, 1 in 1,000, or formalin, 1 in 500. Some operators use irrigation with hot water throughout the operation with the view of checking bleeding, washing away blood, and maintaining antisepsis. But the security of the operation lies in using no douche after the peritoneal cavity has been opened, for the douche may wash septic material farther into the peritoneal cavity. Since abandoning such douches, in 1898, I have not lost a case of vaginal hysterectomy, even when the disease was so much too advanced for operation that a piece of ureter was removed in the growth.

The broad ligaments may be secured by ligatures entirely, by clamps entirely, partly by ligatures and partly by clamps, or by pressure forceps placed upon every artery that bleeds, and left *in situ*. Most operators have their special preference. The plan that I recommend for most cases is to clamp the lower half of each broad ligament, and tie the upper half. The reason is that the lower half of the broad ligament contains dense tissue, and has often to be secured rather close to the cervix on account of the ureter. If it is tied, the ligature sometimes becomes slack and allows bleeding. On the other hand, the upper half of the broad ligament is less bulky and dense, and it may be tied farther from the uterus. There is no fear, therefore, of the ligatures allowing bleeding afterwards.

In general the first step of the operation should be to open the pouch of Douglas from the posterior vaginal fornix. In cases, however, in which the disease is rather advanced and spreading forward towards the bladder, so that it is doubtful whether the operation is practicable, it may be advisable to make the anterior separation from the bladder first. Then, if the bladder wall is found to be infiltrated with cancer so that the growth cannot be separated from it, the operation may be abandoned before the peritoneal cavity has been opened.

In order to open the pouch of Douglas, two vulsella should be fixed in the posterior lip of the cervix, and the uterus drawn strongly downward and forward. A point is then selected on the posterior vaginal wall, so far behind the cervix that the incision will go straight into the pouch of Douglas. This may be tested by placing the finger on the vaginal wall and moving it from side to side. A free lateral slip of the tissues denotes the free peritoneum of the pouch of Douglas intervening. The opposite denotes cellular tissue or adherent peritoneum intervening.

The incision into the peritoneum is made with blunt-pointed scissors. The cervix being drawn downward, there will be no intestines in the pouch of Douglas. The peritoneum being opened, the opening is enlarged enough to admit the finger. The finger is then passed in, and makes sure that the uterus is free from adhesion, and that there is no extension of cancer to the peritoneum. Next the point of the scissors is passed through the opening, and the incision through the septum between the pouch of Douglas and the vagina extended laterally each way as far as the utero-sacral ligaments. Thus a posterior opening is made large enough to allow the fundus uteri to pass through. If there is much bleeding from the incision, any bleeding points may be tied with catgut, or the bleeding may be stopped by stitching the vaginal mucous membrane to the peritoneum.

The next step is to separate the uterus from the bladder. Two vulsella are now fixed in the anterior lip of the cervix, and the cervix is drawn strongly downward and backward toward the perineum, which the handles of the vulsella retract. At this stage it is more convenient to discard the Sims' speculum, while an assistant retracts the lateral wall of the vulva somewhat posteriorly on each side by a retractor of the pattern shown in Fig. 219.

A crescentic incision, the concavity looking toward the cervix, is now made through the vaginal mucous membrane in front of the cervix, so that its ends meet the posterior incision through the vaginal mucous membrane. It should run from $\frac{1}{8}$-in. to $\frac{1}{4}$-in. in front of the junction of cervix and vagina, or still further forward if the cancer is tending to spread to the anterior vaginal wall.

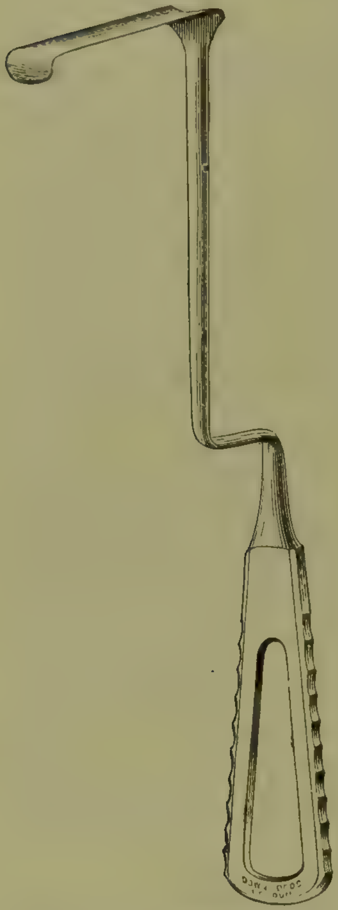
Fig. 219. — Retractor for Vaginal Hysterectomy.

The vulsella on the cervix are now held by an assistant. The operator seizes the bladder wall with dissecting forceps and draws it forward, while he snips with scissors its connections with the severed rim of vaginal mucous membrane and the lower part of the cervix. At this stage he may pass a uterine sound, bent to a suitable curve, into the bladder, so that its point reaches the junction of base of bladder with cervix, to explore exactly to what point the bladder reaches. As soon as the margin of the bladder has been separated for a short distance from the cervix, the cellular tissue generally becomes looser, and the separation can be continued by the finger without any cutting until the anterior pouch of peritoneum has been reached.

In some cases, when there is infiltration, either by cancerous growth or inflammation, or by the spreading border of round-celled infiltration which surrounds a cancer, it may be necessary to make the whole of the separation by dissection with scissors. If there is a suspicion that the infiltration is malignant, some more of the bladder wall may be snipped away with scissors after the uterus has been removed. Or, if there is extension to the bladder only, and nowhere else outside the uterus, the bladder wall which has been attached to the cervix may be excised, and the cavity of the bladder opened. The lines of incision should be arcs of circles, meeting at an acute angle. Care must, of course, be taken to keep within the course of the ureters. The opening in the bladder should be stitched up with interrupted sutures of chromic or formalin catgut, which do not include the mucous membrane. These may be left to dissolve out.

The operator knows when he reaches the anterior pouch of peritoneum by feeling a thin membrane, which slips easily over the subjacent uterus. In order to divide the peritoneum, a Sims' speculum, with short, flat blade, the handle directed forward over the pubes, should be used to retract the bladder. The peritoneum then comes into view, when the uterus is drawn down, and is incised with scalpel or scissors. First one and then the two index fingers are passed through the opening. By separating the fingers laterally the separation of bladder and peritoneum is completed, until both are separated from the whole front of the cervix uteri, and from the broad ligaments for at least half an inch on each side of it. The uterus is then left attached by the broad ligaments only, and the bladder, being pushed upwards, carries the anterior portions of the ureters with it.

Sometimes, when the supra-vaginal cervix is much elongated, or there is old inflammatory fixation or shortening of the utero-sacral ligaments, which interferes with the drawing down of the uterus, there may be a difficulty about opening the anterior pouch of peritoneum. Several expedients are then possible. If at this stage the uterus can be retroflexed, and the fundus drawn down through the posterior opening, the finger may be passed from behind forward over the centre of the uterus, and the peritoneum opened upon it. Sometimes the uterine sound, or narrow-pointed sinus forceps, can be pushed through the peritoneum close to its reflection from the uterus, and the opening torn a little wider until the index finger can be passed in. If these means fail, the best plan is to secure the uterine arteries by clamp or ligature at this stage, and cut away the uterus laterally up to its centre, dividing the utero-sacral ligaments. As soon as these ligaments are divided the uterus can be pulled down lower and the anterior peritoneum brought within reach. It is better, however, if possible, to open the anterior pouch of peritoneum before placing the clamps or ligatures, because it is then easier to make sure that the bladder and ureters have been separated sufficiently from the broad ligaments at the sides of the uterus to allow the clamps or ligatures to be applied without risk to the ureters.

Doyen's clamps are the best to apply to the broad ligaments. Their characteristic feature is that the blades are elastic and concave inward in such a way that when the points meet the centres of the blades are nearly $\frac{1}{4}$-inch apart. By tightening the rack at the handles the blades are rendered parallel, and are then in contact for their whole length. If the broad ligaments are clamped by ordinary forceps with straight blades, the compression is greater near the hinge than it is towards the points, and hence the tissue farthest from the hinge is apt to slip out of the grasp of the forceps. With Doyen's forceps the whole of the tissue seized is compressed equally if the rack is tightened as much as possible. Even with these forceps, however, it is better not to attempt to include the whole of the broad ligament at once. Doyen's forceps are generally made in two sizes. The larger and stronger is about 11 inches long, the blades about $\frac{1}{4}$-inch wide, and having a groove down their centre which helps to prevent the tissue shifting out of their grasp. The smaller is about 8 inches long, the blades little more than half the width, and without the central groove. I am accustomed to use for clamping the lower half of the broad ligaments a modified form of Doyen's forceps, as broad and strong as the larger pattern, but only 8 inches long (Fig. 220). The projecting handles, when left after the operation, are then less inconvenient.

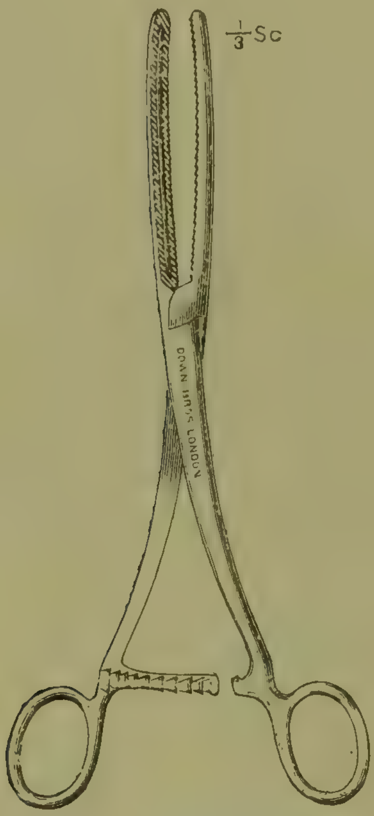

Fig. 220.
Author's Modification of Doyen's Clamp.

The clamps are passed up at the side of the uterus so that the tips of the blades include the peritoneum in front as well as at the back, and reach a little above the centre of the uterus, including in their grasp the utero-sacral ligaments. They should be placed as far outward as can be without endangering the ureters, a little less than half an inch of tissue intervening between the clamp and the side of the cervix. When both clamps are applied, the uterus is cut away laterally with blunt-pointed scissors on each side within the clamp, up to the level of the tip of the blades, the utero-sacral ligaments being thus divided. The incision should not be quite close to the clamp, but leave a slight projecting margin of tissue within it. This is the more readily effected if a very thin-bladed clamp, such as Kocher's artery forceps, is placed temporarily on the inside of the main clamp. This may be left in place till the end of the operation, and tends to prevent any risk of tissue slipping out of the clamp during manipulations. For the sake of clearness it is not shown in Fig. 221.

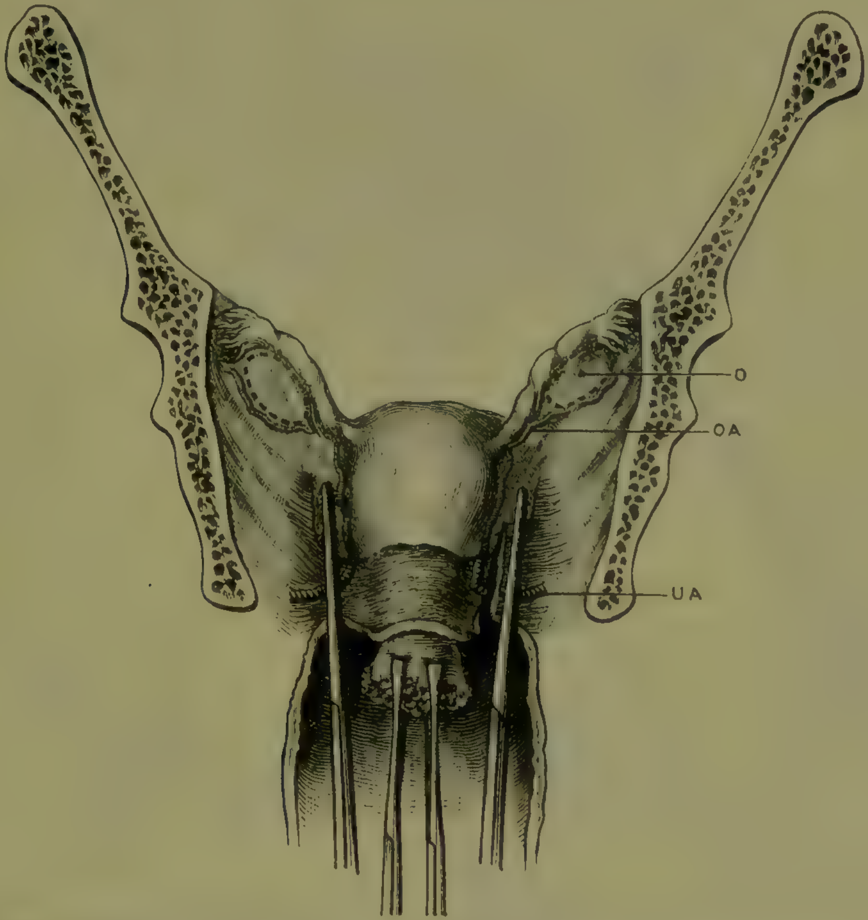

Fig. 221.—Vaginal Hysterectomy seen from the front. Clamps applied to lower halves of both broad ligaments. Uterus separated from lower half of left broad ligament.

O, ovary; O A, ovarian artery; U A, uterine artery.

In Fig. 221 is shown the stage of the operation, as seen from the front, in which the clamps have been applied on both sides, and the lower half of the uterus separated from the broad ligament on the left side.

The next step is to retroflex the uterus, and bring the fundus out through the posterior peritoneal opening, as shown in Fig. 222. After the utero-sacral ligaments have been divided, the uterus, now held only by the lax and elastic upper halves of the broad ligaments, can be pulled down much farther, and the cervix is drawn forward in front of the pubes. The operator passes in a vulsellum through the posterior peritoneal opening, the perineum being retracted by a short-bladed speculum, and catches the posterior wall of the fundus as high as possible. By drawing it down a little, he is enabled to fix a second vulsellum higher up. He repeats the process, and shifts the first vulsellum above the second, and so on, until the extreme

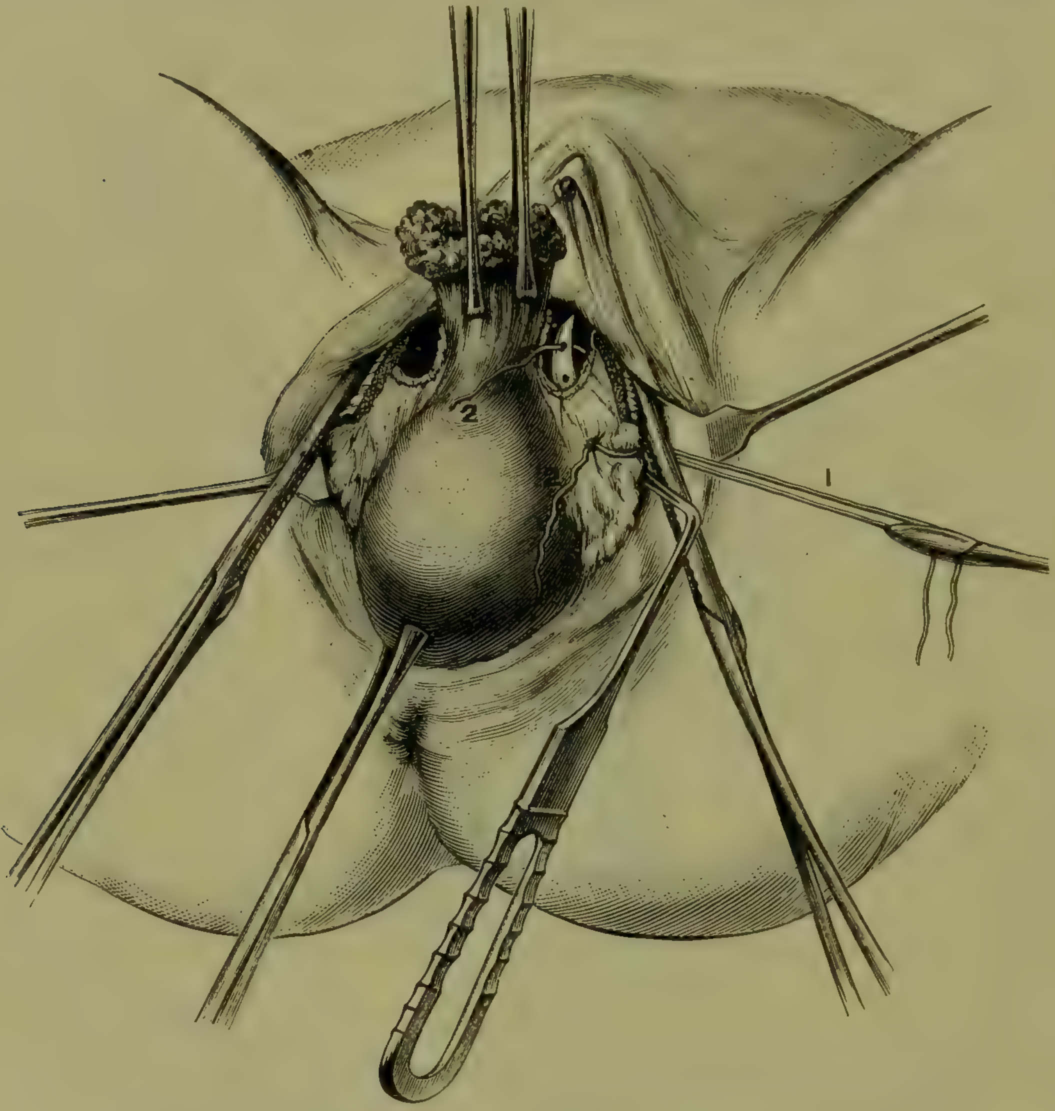

Fig. 222.—Vaginal Hysterectomy. Fundus retroflexed and drawn down externally. Double ligature passed through upper half of left broad ligament. One loop tied (1). End of second loop (2) being passed round broad ligament by curved pedicle needle.

fundus is reached, and pulled down through the opening. To allow this readily to be effected, it is essential that the posterior opening be large enough for the fundus to come through, that the utero-sacral ligaments be completely divided, and that the tips of the clamps do not reach much higher than the centre of the uterus. Otherwise they hold up the fundus, and prevent the folding of the broad ligament upon itself. The broad ligament is thus doubled upon itself about its centre.

The upper half of the broad ligament is now transfixed by a double ligature of silk, Chinese twist No. 4, carried in the semi-blunt pedicle needle shown in Fig. 198, p. 396. One loop is tied over the free peritoneal margin, now directed downward (1, Fig. 222). To tie the second loop the special pedicle needle shown in Fig. 223, curved in a plane oblique to the handle, is used. The characteristic of this needle is that the point is brought round into reach by simple rotation of the handle. The end of the second loop is thus passed behind the broad ligament, and brought out above it, where it is unthreaded from the needle (2, Fig. 222). The second loop being tied, one of the loops is again passed, by the aid of the same curved needle, around the whole. After tying, the ends of this are left long, for the ultimate removal of the ligature, the ends first tied being cut short. Care should be taken that the two loops cross, so that the whole ligature comes away together.

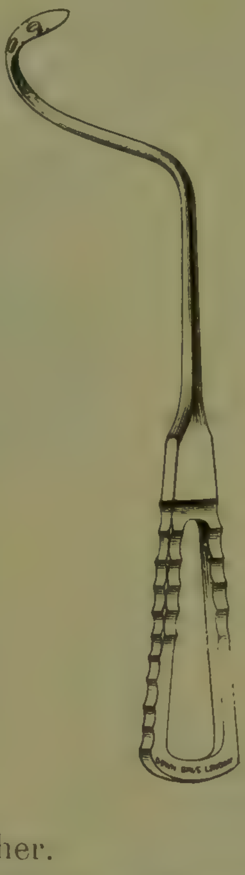

Fig. 223.—Needle for Ligaturing Broad Ligament.

The uterus is now cut away from the left broad ligament, and remains attached only by the upper half of the right broad ligament as a pedicle. It is easy to tie this in two halves. and then pass one of the loops around the whole, as on the left side; and thus the uterus is finally removed.

The ligatures may be cut short; but as it is impossible to keep the vagina absolutely sterilized, at any rate from saprophytes, they are apt to become infected, and then maintain a sinus. It is better, therefore, to leave them long, and ensure their complete separation before the patient leaves her bed.

When the uterus has been removed, special care should be taken to avert the risk of leaving any cancerous juice to infect the cut surfaces. This is done by repeatedly swabbing out the vagina and adjacent peritoneum with formalin solution, 1 in 500; but no douche should be used.

The peritoneum should then be stitched up, and the pedicles of the broad ligaments fixed in the vagina, by sutures applied as shown in Fig. 224. Hagedorn's needle-holder, a small Hagedorn needle, and fine chromic gut are used, the sutures being left to dissolve out. It is often convenient to use the form of Hagedorn's needle-holder having an oblique catch. The first suture is passed through the edge of the posterior peritoneum, then through the peritoneum of the pedicle of the left broad ligament, on the proximal side of the ligature, and, finally, through the edge of the anterior peritoneum. A similar suture is passed to secure the pedicle of the right broad ligament. Finally, one or two sutures are placed in the centre to unite the edges of the anterior and posterior peritoneum.

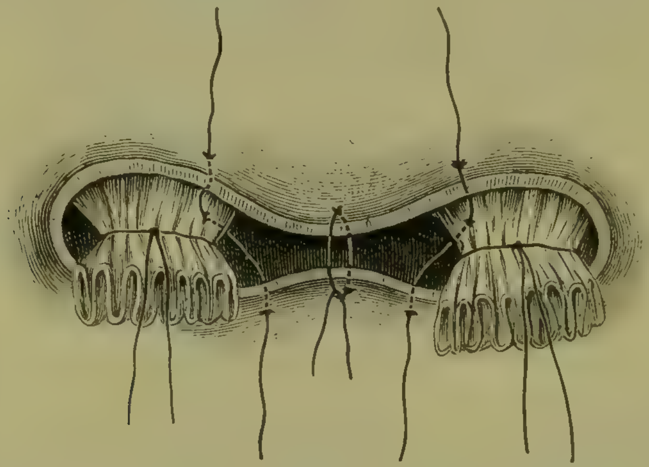

Fig. 224.—Vaginal Hysterectomy. Mode of placing sutures to unite the edges of peritoneum after removal of uterus, and fix the pedicles of the broad ligaments in the vagina.

Some operators leave the peritoneum open. It does not appear to affect the mortality of the operation, whether the peritoneum is stitched up or not. But there is a presumption that intestines are much less likely to become adherent above the wound if the peritoneum is stitched up, and the pedicles, which have to slough, are fixed in the vagina and isolated from the peritoneal cavity. Intestinal obstruction from adhesion has been known to follow the operation. Even if the pedicles are not fixed by sutures in the vagina, it is advisable to unite the peritoneum at the centre by one or two sutures, to make sure that no intestine can come down into the vagina.

The operation can be performed more quickly if the operator, at the stage shown in Fig. 222, when the uterus is retroflexed, instead of using ligatures, secures the upper half of the broad ligaments by clamps, the points of which are directed toward the centre of the broad ligament. The two clamps thus hold the broad ligament folded upon itself at the centre. The smaller and slighter pattern of Doyen's clamp may be used for this purpose.

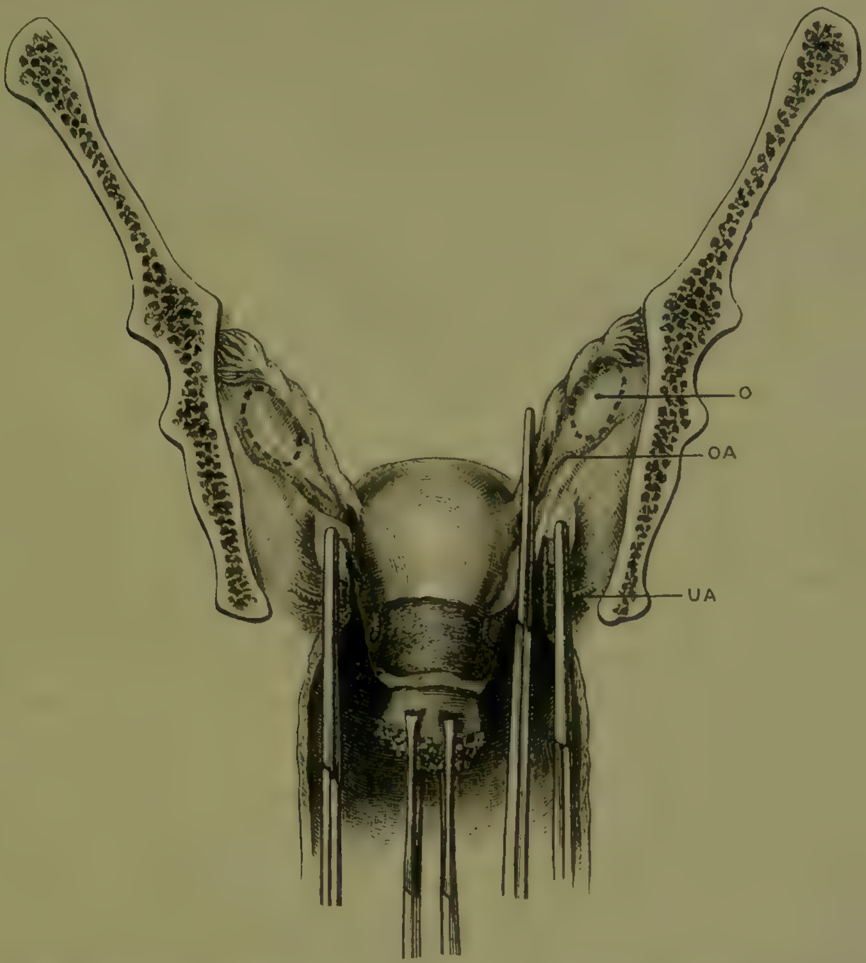

Fig. 225.—Vaginal Hysterectomy. Method of securing broad ligaments by clamps.
O, ovary; O A, ovarian artery; U A, uterine artery.

If the uterus cannot be retroflexed, nor anteflexed and drawn through the anterior opening, it must be pulled straight down. After division of the utero-sacral ligaments, the uterus can be drawn low enough to bring the angles of the uterus and upper edges of the broad ligaments into reach. A second clamp is then applied to the upper half of each broad ligament, as shown in Fig. 225, and the uterus cut away. The tips of the blades should just include the free edge of the broad ligament, and care must be taken to make sure that they do not nip any intestine. The clamp on the second broad ligament is applied with comparative ease after the uterus has been cut away on one side. In the clamp operation also it is advisable to place two stitches in the centre to unite the edges of anterior and posterior peritoneum, and prevent intestine coming down into the vagina.

At the end of the operation the vagina should be plugged with sterilized moist iodoform gauze, 10 per cent. The best method is to plug with two strips simultaneously, the upper end of each strip being packed into each corner close up to the tip of the clamp on the broad ligament. A separate piece of gauze should be placed outside the handle of each clamp, between it and the vagina, in order to protect the sides of the vulva from the pressure of the handles. The end of each strip of gauze is left hanging a short distance outside the vulva, so that it acts as a syphon to drain away the discharge. A pad of mercurial wool is placed beneath to absorb the discharge, and changed frequently.

The clamps may be removed, if required, at the end of twenty-four hours. But, in the case of cancer, it is preferable to leave them for forty-eight hours, so as to secure complete sloughing of the tissue grasped in them, and so give the diseased uterus a wider margin at the sides. To remove a clamp, the catch at the handle is detached, then the handles are separated until the blades are felt also to separate. Then the handles are closed again somewhat, and the instrument is drawn straight down.

The gauze is left when the clamps are removed. It need not be changed up to three days if the patient is going on favourably. The plug is then renewed, smaller in size than the first, at twenty-four or forty-eight hours' intervals. At the time of changing, the vagina may be swabbed out with an antiseptic, but no douche should be used up to six days. To change the plug it is best to turn the patient somewhat to the side, and retract the perineum with a short straight Sims' speculum. At the end of six or seven days the plugs are discontinued, and a vaginal douche of a non-poisonous antiseptic, such as chinosol, 1 in 400, in boiled water, is used two or three times a day. A catheter should be used as long as there is a plug in the vagina.

The discharge generally becomes somewhat offensive after a few days while the pedicles and clamped tissue are sloughing, until the pedicles come away; but usually this leads to no constitutional disturbance. The ligatures usually separate at from ten to fourteen days. If they have not done so by the end of three weeks, when the patient is ready to get up, they may be separated in the following way:—A piece of gauze is rolled tightly in the form of a cylinder, and covered with gutta-percha skin. The ends of a ligature are tied round the centre of the gauze cylinder, so that the cylinder lies close up against the vulva. The cylinder is then rotated progressively so that the ligature is twisted, and thereby shortened till an elastic tension is placed upon the embedded loop. The cylinder may be rotated farther if the ligature gets slack. The effect is that the loop cuts out, and comes away in not much more than twenty-fours hours. If another ligature remains, it is then treated in the same way.

It is well to examine the vaginal cicatrix by speculum a few weeks after the operation, for sometimes prominent granulations appear upon it. It is necessary to snip these off or touch them with solid nitrate of silver to obtain a completely healed scar. Chlorate of soda has been supposed by some to be antagonistic to cancer. I have been accustomed to order a tampon soaked in sod. chlorat. gr. xxx., glycerin. ℥ss., aq. ad ℥i., to be kept in the vagina, and changed once or twice a day, till the healing is complete. It appears at any rate to promote the healing. Chlorate of soda may also be given in fifteen-grain doses three times a day, for a year or two after the operation.

Supra-vaginal Amputation of the Cervix.—The patient is arranged as for vaginal hysterectomy; the perineum is retracted by a Sims' speculum with a short blade, and the cervix is drawn down by vulsella. If room is insufficient, incisions of the perineum and vagina may be made in the same way as for vaginal hysterectomy. A crescentic incision is made through the vaginal mucous membrane behind the cervix, at a less distance from it than in vaginal hysterectomy. Then the operator separates the tissue by finger or blunt instrument, or, if this will not avail, by dissection, keeping close to the uterus, and pushing the pouch of Douglas upward and backward, until the back of the uterus is separated up to the level of the internal os. (*c a*, Fig. 226, p. 442, shows the line of separation.) If the peritoneal cavity is opened accidentally, it is closed by catgut sutures.

Next, another crescentic incision is made through the vaginal mucous membrane in front of the cervix, the ends of which meet the posterior incision at the sides. The separation from the bladder is made just as for vaginal hysterectomy, until the anterior pouch of peritoneum is reached, but not opened. The separation is extended laterally across the whole front of the cervix and for at least half an inch on each side of it.

The simplest mode of securing the vessels is to place a Doyen's clamp on the broad ligament at each side, the tips of the clamp reaching to the top of the separated tissue. Then the cervix is cut away from the broad ligaments within the clamps, and finally the axis of the uterus is cut across transversely, or excised in somewhat conical shape. The lines of incision are shown in Fig. 226.

If ligatures are chosen instead of clamps, the curved needle shown in Fig. 223, p. 437, is the best for passing them. The needle is threaded with No. 4 Chinese twist, and passed through the broad ligament from before backward. The ligature is less likely to slip off if the needle, with a double ligature, is first passed through near the lower margin of the remaining lateral attachment of the cervix. One loop is tied up, and secures this lower margin. The anterior end of the second loop is again passed through at the upper limit of separation, and this loop is tied posteriorly. Each side is thus secured by a double loop. The ligatures must be within half an inch from the side of the cervix.

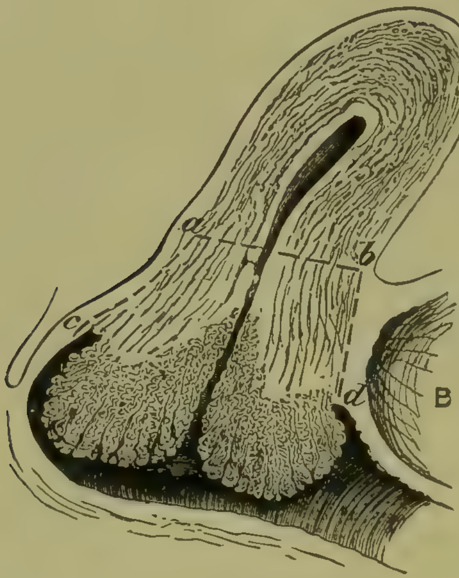

Fig. 226.
Lines of Incision in Supra-vaginal Amputation of the Cervix Uteri.

After the cervix has been cut away the piece removed should be examined, to make sure that a sufficient margin of healthy tissue has been removed. If not, the fundus should also be removed; otherwise, the cavity is firmly plugged with iodoform gauze. Some operators used to stitch the mucous membrane of the vagina to the endometrium, and this is an advantage if it can be done.

The clamps and plug may be removed at forty-eight hours. If the peritoneal cavity has not been opened, no plug need be replaced, and vaginal douches may be commenced then. If it has, it is preferable to continue the plug and avoid douches up to six days, as in the case of vaginal hysterectomy.

Abdominal Hysterectomy for Cancer.—This operation is performed with the view of removing the broad ligaments more widely than can be done in vaginal hysterectomy, and searching out and removing the lymphatic glands liable to be infected. It is as yet upon its trial. The lymphatic glands are not affected very early in cancer of the uterus, and are not generally manifestly affected while the disease is limited to the uterus, and the uterus is movable. When recurrence takes place it most frequently occurs in the vaginal cicatrix. The mortality of the more extensive operation is greater. It is estimated at not less than 15 per cent., and some authorities have put it as high as 45 per cent. On the other hand, the mortality of vaginal hysterectomy is reckoned at not more than 5 per cent., and should probably be practically *nil.* Moreover, it is not certain that it is possible to find and remove all the glands which are liable to be affected. When cancerous glands have been removed, and a fatal result has followed the operation, other cancerous glands have been found left behind.

So far, therefore, it appears that the increased risk of the operation is greater than the chance of its eradicating the disease when vaginal hysterectomy would have failed to do so. It does not, therefore, seem at present advisable for early cases of cancer, but there is more in its favour when the disease is further advanced. The ultimate test will be the comparative freedom from recurrence, but the more extensive operation has not yet shown a very preponderant advantage in this respect.

Operation.—The patient is placed in the Trendelenberg position at a high angle. A fairly long abdominal incision must be made, reaching as low as the pubes. Doyen's abdominal retractor may be used with advantage, as in hysterectomy for fibroid tumour. The small intestines are pushed back out of the pelvis, and held back by a large pad.

The operator, if an expert in Kelly's method for catheterizing the ureters, may have previously passed bougies or catheters into the ureters from the bladder. If not, the ureters are to be sought at the brim of the pelvis, 1½-in. at each side of the sacral promontory, and traced downward to the broad ligaments. An incision over the peritoneum covering them is to be made for this purpose, and will serve afterwards for the search for lymphatic glands. If it is difficult to find the ureter, the peritoneum over the ovarian vessels at the edge of the pelvic brim should be divided, and the vessels pinched up by the finger and thumb. The ureter will then generally be put on the stretch and elevated as a flat cord lying on the pelvic floor.

The uterus having been drawn up, the ovarian vessels are tied as far outward as possible. The round ligaments are tied and divided. The anterior peritoneum between the round ligaments is divided above the level of the bladder, as in hysterectomy for fibroid tumours, and is stripped down with the bladder from the front of the cervix and the upper inch or more of the vagina.

Each broad ligament is then opened up by incision of the peritoneum. A thin Doyen's clamp is placed near the uterus to control venous bleeding, and the uterine artery is traced as far as possible outward toward the pelvic brim, and there tied and divided. The broad ligament is then removed from without inward in the form of a wedge, with the apex at the divided end of the uterine artery, and the base toward the uterus. The operator goes as close as possible to the ureter, the position of which has been ascertained.

Both broad ligaments having been separated, except at their uterine attachment, an incision is made through the peritoneum at the bottom of the pouch of Douglas, and the vagina separated from the rectum down to about half the length of the vagina. The front and sides having been divided to the same level, clamps bent at a right angle are placed across the vagina, and the upper half of the vagina removed with the uterus. Ligatures are placed on any bleeding vessels.

A search is then made for pelvic lymphatic glands, especially along the course of the internal iliac veins, and about the bifurcation of the common iliac artery, and all found are removed. Finally, a strip of moist iodoform gauze is passed from the abdomen out through the vagina, and plugs the cavity in the cellular tissue. The peritoneum is stitched together over the plug as in panhysterectomy for fibroid tumours, and the incisions in the peritoneum made to aid the search for lymphatic glands are stitched up in a similar manner.

The proportion of permanent cures after vaginal hysterectomy naturally depends very much upon whether the operation is limited to cases where the disease has not spread beyond the uterus, or whether the patient is given the benefit of the chance of cure even if it appears to be only a forlorn hope. The proportion of cases considered suitable for operation varies, according to the statistics of different places, from 10 to 50 per cent. of those applying for treatment. Taking the average of a large number of statistics, it appears that about 30 per cent. of all cases are suitable for vaginal hysterectomy, and that of patients surviving the operation about 30 per cent. will be well five years afterwards, and that in the greater number of these the cure will be lasting. Thus, out of all patients presenting themselves for treatment, a lasting cure may be obtained by vaginal hysterectomy in 8 or 9 per cent.*

The rule of abstaining from operative interference, when it is impossible to remove the disease wholly, does not apply so much to cancer of the cervix as to that of other parts of the body, since a large part of the cachexia, whether due to hæmorrhage or septic absorption, depends upon the presence of the diseased surface in a situation exposed to friction and subjected to the influence of warmth and moisture. Whenever hæmorrhage is an urgent symptom, and a vegetating surface exists, removal of a portion of the growth will often arrest hæmorrhage and do away with the fœtor of the discharge for a considerable period. This may be carried out whenever the disease is not so advanced that a risk would be run of opening the peritoneal or other cavity. Any prominent mass round which a wire can be placed may be sliced off by the galvanic écraseur. To remove the deeper tissue the best instruments are the sharp spoons introduced by the late Professor Simon (Fig. 227, p. 446), which are made of various shapes and sizes. In scraping away the tissue by their means a selective action is exercised, since the cell-masses of the cancer are readily removed, while the normal tissue is more resistent. The selective action will not extend, however, to the infiltration of scattered cells among normal tissues outside the borders of the growth, while for the harder forms of cancer, containing a large proportion of fibrous tissue, these spoons are less effective.

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* *See* Wilson, "Results of Vaginal Operations for Cancer of the Uterus." "Journ. of Obstet. and Gynæc.," May, 1902.

Caustics may also be used, either in the first place, or, preferably, after the more friable and manifestly cancerous tissue has first been scraped away. We may then employ either the actual, benzoline, or galvanic cautery, or chemical agents, as the potassa fusa, potassa cum calce, chloride of zinc, or alcoholic solution of bromine. Potassa fusa or potassa cum calce must be used with the precautions previously described. The solution of bromine, first recommended by Routh, and very highly lauded by Schroeder, is supposed to exert a special influence upon cancer cells, and is certainly an efficient caustic. One part of bromine dissolved in five parts of rectified spirit* may be applied on a tampon of cotton-wool. This should be covered with a piece of gutta-percha skin, and a large tampon soaked in carbonate of soda placed in the lower part of the vagina to protect the intact mucous membrane by neutralizing the bromine which escapes. If the vagina be sufficiently protected, the caustic may be left in place from six to twelve hours.

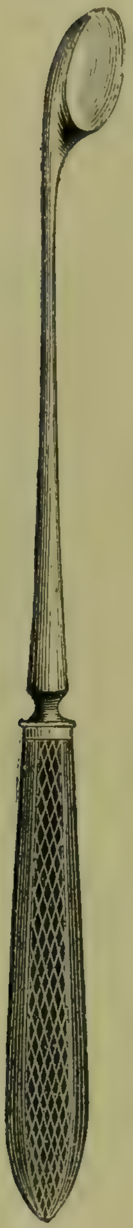
Fig. 227.—Simon's Sharp Spoon for scraping cancer.

If all manifestly diseased tissue has been successfully removed by scraping, it appears best to use an indiscriminate caustic, in order to destroy all the neighbouring tissue into which outlying parts of cancer cells, or cancer germs, may have penetrated. For this purpose there is nothing better than the solution of chloride of zinc, 300 grains to the ounce. This is applied on a tampon of cotton, squeezed rather dry. A piece of gutta-percha skin, wrapped in oiled lint, may be placed next, and then a larger tampon, soaked in solution of carbonate of soda and squeezed dry, to protect the vagina as much as possible. After about six hours, the lower tampon should be removed, and the vagina syringed with a weak solution of carbonate of soda. The cotton soaked in the chloride of zinc may be left for a week or ten days, at the end of which time it will bring away with it a white cup-shaped slough, free from smell, and a quarter of an inch or more in thickness. Opiates are generally required after the application of the caustic. Some employ an even stronger solution, namely, equal parts of the chloride of zinc and of water.

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* The mixture should be made cautiously, the bromine being slowly added to the spirit, on account of the heat developed, and care should be taken not to inhale too much of the fumes, which are irritating to the lungs, and may even damage the sense of smell.

Of less potent caustics, which may be repeatedly applied, formalin is one of the best, and appears to have a specially destructive effect upon cancerous material. Pure formalin may be applied by a swab to the diseased surface through a speculum; or a more dilute solution, 10 to 20 per cent., may be applied by a tampon, and left for some hours *in situ*. The tampon should be covered by a piece of gutta-percha skin, and the rest of the vagina protected by a plug of gauze moistened with oil. In one case I have obtained a five years', and apparently permanent, cure of cancer, recurrent in the cicatrix after hysterectomy, by one application of chloride of zinc, followed by formalin used once a fortnight for months.

In cases in which fixation of the cervix shows that the disease has already reached the cellular tissue, and in the absence of any large vegetating growths, excessive hæmorrhage, or fœtid discharge not to be kept in check by the use of antiseptics, any active operative interference only assists the spread of the disease deeply into the cellular tissue, and thereby accelerates its most painful stage.

Interference is specially to be avoided if the disease is so advanced that a deep friable ulcer has been formed, threatening to penetrate into rectum or bladder.

Palliative Treatment.—In a considerable proportion of cases of cancer of the cervix there is, therefore, no hope of benefit from even a partial removal of the growth. In the slower and more infiltrating forms of the disease, with little tendency to vegetation, hæmorrhage may often be kept in check by occasional application to the ulcerated surface of somewhat milder caustics than those hitherto mentioned, such as strong nitric or carbolic acid, or a saturated solution of chromic acid. When the disease is too extensive, and ulceration too far advanced to allow any strong caustic to be used, the condition of the surface may often be improved, and hæmorrhage and fœtor diminished, by the occasional application of the dried sulphate of zinc in powder. This may be kept in place by a tampon of cotton-wool, and left from twelve to twenty-four hours. If hæmorrhage is severe, the liquor ferri perchloridi fortior, which acts as a caustic of moderate strength as well as a styptic, or a paste made with the solid perchloride of iron and glycerine, may be applied from time to time. A large crystal of iron alum, which the patient may herself pass up to the upper part of the vagina, is a useful means of checking any sudden onset of bleeding. Besides the stronger caustic applications, great benefit may be derived from the constant use of astringent and antiseptic solutions, by which the surface of the growth is hardened. A lotion of formalin, 1 in 500, is perhaps the most effective as a deodorant, as well as for hardening the tissue and checking the tendency to hæmorrhage. As an astringent and antiseptic combined, from one to two drachms each of tincture of iodine and of solid perchloride of iron, dissolved in a pint of water, form also a very useful lotion. As simple astringents, alum, iron alum, or acetate of lead may be used. As an antiseptic, permanganate of potash is of little avail. Perchloride of mercury and carbolic acid are the most powerful, but weak solutions of iodine or bromine, or a lotion containing two drachms to the pint of liquor sodæ chloratæ, or liquor calcis chloratæ, are also effective. Peroxide of hydrogen forms a good deodorant and disinfectant, free from poisonous or irritating effects. It may be used in the form of Eau Maiche or Marchand's hydrozone (1 in 30 to 1 in 10). Parke, Davis, & Co.'s acetozone, 1 in 10,000, used in large quantities, acts in a similar way. A suppository, containing five grains of iodoform with ten minims of oil of eucalyptus, may be passed into the vagina on each occasion after the use of the syringe.

Cancer of the cervix uteri being a rapidly growing form of cancer, the use of the X-rays is not so hopeful for its treatment as for that of more chronic forms of the disease. I have found that in some cases it appears to relieve symptoms, hæmorrhage and pain, and the patients have considered themselves better for the treatment. I have not, however, met with an instance of cure or even arrest of the growth obtained by this means; but its effect upon other forms of cancer makes it worthy of further trial, and some have met with more promising results. The cases most suitable for the treatment are those of cancer which is inoperable, but not too extensive to allow a fair access to be obtained to it through a speculum. A metal or platinum-lined Ferguson's speculum should be used; or a tube like a speculum may be fitted to the X-ray tube. The skin around the speculum should be protected by lead foil. The X-ray tube should be one of high vacuum to diminish the risk of burn of healthy tissue. The rays may be used at first for ten minutes every other day. Later, the time and frequency of application must be regulated by the effect produced.

Since removal of the ovaries, followed by the administration of thyroid extract, has in some cases led to disappearance or shrinking, at any rate temporary, of inoperable cancer of the breast, it might be thought probable that it would have a similar effect on cancer of the cervix uteri. I have made trial of it in some cases of inoperable cancer, but have not met with any manifest diminution of the disease in consequence, though some patients for a time considered that they were better. The reason is probably the same as that of the comparative failure of the X-ray treatment, namely, the active character of the growth.

Chian turpentine, introduced in 1880 by Mr. John Clay as a cure for cancer of the cervix, has been found to fail, like other reputed cures for cancer. I have tested it in a considerable number of cases, and have not found any arrest of the growth in any one. In some cases at an early stage I have found that, over an interval of several months, the hæmorrhage and sometimes also the pain have appeared to be diminished, and the surface of the growth has seemed to bleed less easily on touching. In other instances the drug appears to be useless. It is probable that the benefit derived from it may be explained by its acting as a styptic, like other forms of turpentine, and diminishing the blood-supply. I have known, however, a patient who, persevering with Chian turpentine, lived sixteen years after removal of cancer of the breast before she died of internal metastasis, while local recurrences repeatedly disappeared.

The Chian turpentine is likely to be best absorbed if given in emulsion rather than in pills. It may be dissolved in ether or hot rectified spirit, and the solution added to a mucilaginous mixture, flavoured with syrup of lemons or syrup of ginger. Mr. Clay recommended eight grains for each dose.

As regards the general treatment, total sexual abstinence should be strictly enjoined, diet should be light, and stimulants should be avoided, or used sparingly. Internal remedies do not exercise much control over hæmorrhage, but ergot and gallic acid may be of service, in conjunction with local measures. In most cases, as the disease advances, the most urgent indication is to alleviate pain. In the earlier stages, hyoscyamus with camphor, cannabis indica, especially in the form of chlorodyne, belladonna, or conium may be tried, but generally their effect is not to be compared with that of opium and its alkaloids, and their chief use is for those cases in which the latter are not well tolerated. If opium and morphia are not well borne when taken by the mouth, they will often answer in the form of suppositories or subcutaneous injections. Batley's liquor opii sedativus or nepenthe is generally the most suitable form of opium for protracted use. The dose should not be increased too quickly at first, but, in a fatal disease, there should not be too much reluctance to establish an opium habit, and very large doses may be required before the close. Care should be taken, at the same time, to regulate the bowels, and secure that the fæces are soft. The general cachexia may be combated in some degree by tonics, especially quinine and iron, and gastric remedies are often required to alleviate indigestion.

Rodent ulcer, or *corroding ulcer* of the cervix uteri is a very rare disease. It is distinguished from cancer by its slow progress, lasting over many years, and by the absence of any cancerous deposits in the ulcerated surface. On microscopic section, only infiltration with inflammatory cells is seen. The disease may, like cancer, lead to destruction of a large part of uterus and vagina, and ulceration into bladder or rectum. It generally occurs in elderly or old women. Its true pathology is uncertain, and recent histological evidence on the subject is wanting. It does not seem to be the same disease as rodent ulcer or rodent cancer of the skin; but it is possible that the infiltrating round cells may be really of the nature of sarcoma. Some forms may be identical with the so-called lupus of the external genitals. Sir John Williams regarded two cases described by him as senile gangrene, due to kidney disease, and calcification of the iliac arteries; and suggested that others might be lupus, on the ground that, in one of his cases, tubercles and cicatrized surfaces were observed.* Neither the structure nor the bacilli of tubercle have, however, been demonstrated.

Treatment.—In the early stage, free destruction of the surface with the benzoline cautery or potassa fusa appears to hold out some hope of cure. Treatment by X-rays also seems to afford a prospect of success, in view of the chronic nature of the disease, and the satisfactory result of the X-ray treatment in rodent cancer of the skin, which has, at any rate, some resemblance to the disease in question in the preponderance of ulceration over any evidence of growth.

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* "Obstet. Trans.," vol. xxvi.

CANCER OF THE BODY OF THE UTERUS.

Causation.—Cancer of the body of the uterus, while very much less frequent than that of the cervix, is yet not extremely rare. It does not show the same preference as cancer of the cervix for married women and those who have had many children, but is, on the contrary, more common in the nulliparous. True carcinoma of the body of the uterus occurs later in life than that of the cervix. It is rare under forty, and commoner between fifty and sixty than between forty and fifty. Sarcoma, however, occurs with a relatively greater frequency during the period of sexual activity.

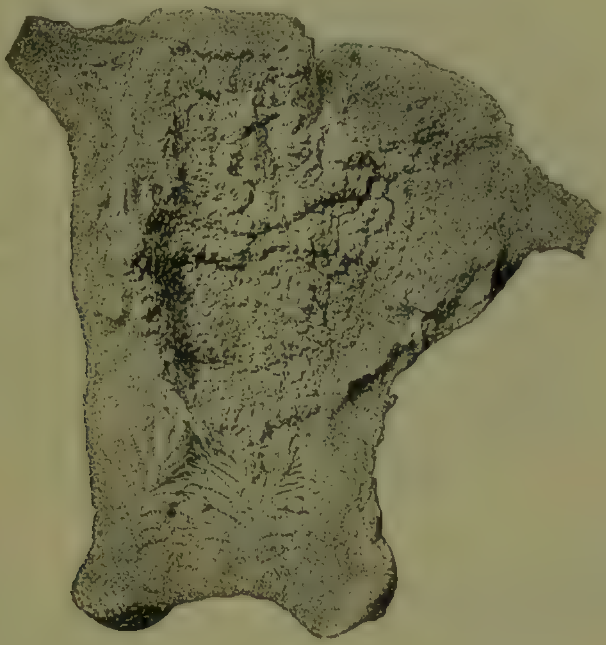

Fig. 228.—Carcinoma of Fundus Uteri.
(From a photograph.)

It may be inferred that if, as is probable, cancer is a parasitic disease, the parasite generally gains access to the cervix through the vagina; but probably reaches the fundus through the circulation, or in some other way than by the vagina.

Pathological Anatomy.—*Glandular Carcinoma.*—The commonest form of cancer in the fundus uteri is glandular carcinoma, commencing in the glands of the endometrium. It is generally more or less diffused over the uterine surface; but it may be limited to a part of it, or may affect the whole surface, as shown in Fig. 228. In histological character it resembles cancer of the intestinal mucous membrane, and differs from glandular carcinoma of the cervix uteri in the fact that it retains, to a certain extent, the glandular type throughout its course. The structure, however, shows a progressive deviation from normal glands as the disease is more advanced. At first there is proliferation of the glands, which invade the muscular wall, with irregular thickening of their epithelium; this no longer forms a regular lining, but grows into masses which encroach on the lumen of the gland. Later, there are proliferations into the lumen of the glands of upgrowing septa, so as to form loculi; and cell-masses of atypical columnar epithelium invade the connective-tissue stroma, or structures like halves of glands, without the corresponding half, may be seen lying in the stroma (Fig. 229). In late stages the solid cell-masses may preponderate over the glands, but there is always some appearance of glandular lumen to be seen.

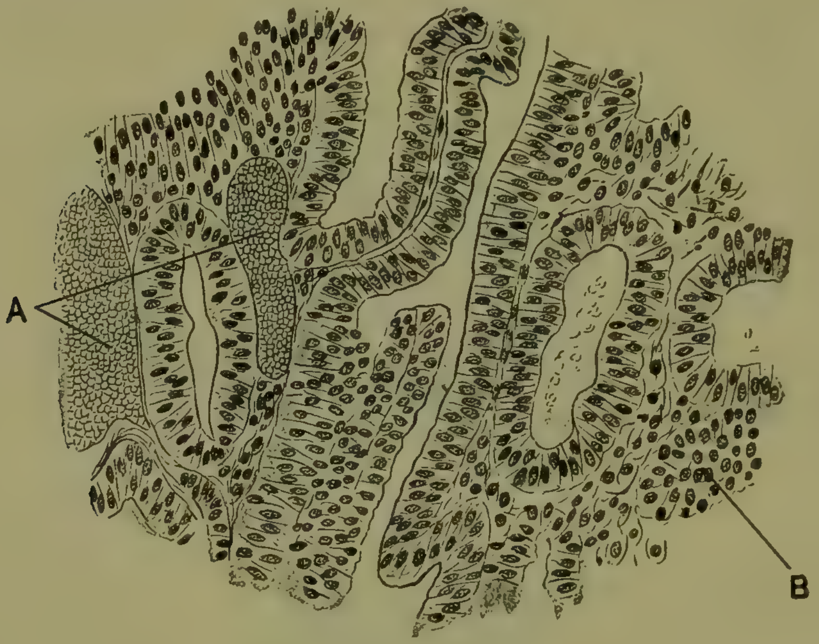

Fig. 229.—Adenoid or Cylindroid Carcinoma of Fundus Uteri.

A, vessels; B, epithelial masses invading stroma.

The growth being enclosed by a firm wall of uterine muscle, its progress is much slower than that of cancer of the cervix, and the prognosis more hopeful after removal. It does not infect the glands very early, and may remain in some cases limited to the uterus for as long as from two to four years after the commencement of symptoms.

The uterus becomes enlarged, and the growth gradually approaches the surface. Eventually it forms adhesions and spreads to intestines, or other adjacent structures, or into the broad ligaments. It is liable to infect the lumbar glands up to the level of the kidneys. Occasionally the inguinal glands may be infected from the lymphatics running from the corners of the uterus along the round ligaments. Sometimes the growth breaks down into the peritoneal cavity, and sets up a limited abscess or general peritonitis.

Carcinoma of the fundus is not unfrequently associated with fibroid tumours, which it invades, starting from the endometrium. In the case of sub-mucous fibroid, I have found the carcinoma extending over the whole mucous membrane covering the fibroids, but not to other parts of the endometrium. There appears, therefore, some reason to believe that fibroid tumours may predispose to carcinoma of the endometrium, without undergoing malignant degeneration themselves.

Malignant adenoma is a more rare condition. In this there is no invasion of the stroma by cell-masses, but only proliferation of the glands. The malignancy is shown either by excessive exuberance of the gland proliferation, with little or no stroma, so as to form a friable tissue, or by the glands infiltrating deeply the muscular wall. The degree of malignancy is presumably less than that of carcinoma, and the prognosis after removal more favourable. The course of the disease is slow, and glandular infection late. As regards histology, two varieties have been described, *adenoma malignum invertens*, in which septa grow inward towards the lumen of the gland, forming loculi; and *adenoma malignum evertens*, in which glandular diverticula grow outward into the stroma. But the two may be mixed in the same case. Generally the disease is not circumscribed, but diffused over the endometrium.

Sarcoma.—There are two main varieties of sarcoma in the fundus uteri, spindle-celled and round-celled, but intermediate varieties occur. Both varieties may be either circumscribed or diffuse. Sarcoma is apt to occur earlier in life than carcinoma.

The circumscribed form of spindle-celled sarcoma or fibro-sarcoma more or less resembles a fibroid tumour, and sometimes can only be distinguished from it by the microscope. In general the growth is more rapid in progress, redder, more vascular, and not so hard, nor is it multiple. If there is any admixture of round cells, a milky juice may be scraped from the section. Not unfrequently it is difficult to determine whether the growth arose by sarcomatous degeneration of a fibroid tumour or was sarcomatous from the commencement But, in some instances at any rate, the similarity of the general arrangement of the tumour to that of a myoma supports the view that it was a myoma in its commencement. This question has been discussed under the head of Fibroid Tumours (*see* p. 374). The form of spindle-celled sarcoma which becomes polypoid, or projects into the cavity of the uterus, used to be described as recurrent fibroid. Spindle-celled sarcoma probably always originates in the muscular wall of the uterus.

Round-celled sarcoma may arise either in the muscular wall or endometrium, and forms a soft tumour, easily breaking down and causing free hæmorrhage. Sometimes it enlarges the uterus to a great size, and forms a mass so soft that a sound can be passed through it with little or no resistance. Large spaces filled with blood-clot may be formed in the interior. An abundant milky juice can be scraped from the cut surface. The tumour quickly leads to metastases in lungs, liver, and other viscera.

I have met with some cases of circumscribed sarcoma, apparently arising from the endometrium, in which the growth could only be distinguished by the microscope from carcinoma of the endometrium, and in which the cells were small, about the size of inflammatory cells. It would thus be difficult to distinguish the condition from inflammation, except for the presence of an obvious tumour, bleeding and breaking down.

Some instances have been recorded of a condition in the fundus uteri resembling the corroding ulcer of the cervix. The disease ran the course of cancer, with progressive ulceration and bleeding, and killed the patient. But on microscopic section, only an infiltration with round cells, like inflammatory cells, could be found. The cases referred to in the previous paragraph suggest that these also may have been a form of sarcoma, with great preponderance of ulceration over proliferation.

Deciduoma Malignum or Chorion-Epithelioma.—This is an entirely distinctive and rare form of malignant disease of the fundus uteri. It has only been described within the last few years, but over 180 cases of it have now been recorded. There appears to be some reason to think that it is commoner on the Continent than in Britain.

In 1896 a Committee of the Obstetrical Society of London came to the conclusion that some cases of deciduoma malignum submitted to it were instances of sarcoma of the uterus, without any special relation to pregnancy. But the opinion then already held on the Continent is now almost universally accepted, that the disease is the result of pregnancy, and arises from the implantation of fœtal structures upon the mother.

The causal relation is abundantly proved by the frequency of vesicular mole as an antecedent. Of the first ninety cases recorded, forty-nine followed a vesicular mole. It is reckoned that vesicular mole occurs only about once in 2,000 pregnancies. Not more, therefore, than about one woman in 20,000 has at any time had a vesicular mole within a year. On this basis, it can be calculated that the probability is an unimaginable number of billions of billions to one against a vesicular mole having preceded, within a year, forty-nine out of ninety cases of deciduoma malignum, if there were no causal relation between them.

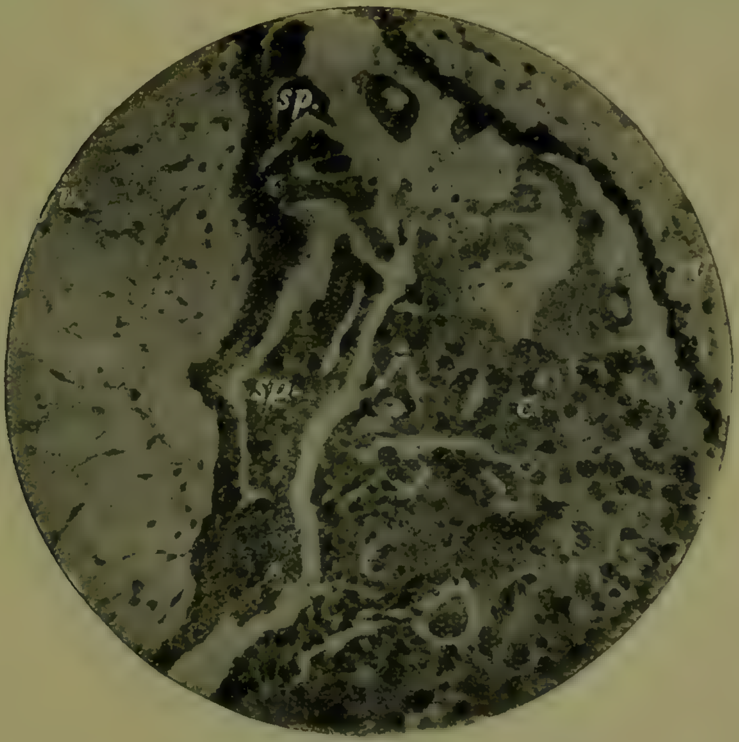

Fig. 230.—Section of Vesicular Mole.

sp, syncytium proliferating into branching processes ; *c*, syncytium partially differentiated into cells ; *v*, myxomatous villus. × 240

(From a photograph.)

The ages at which deciduoma malignum has been found vary from seventeen to fifty-five. The average age is thirty-one. A very few cases have been recorded as much as two years after the menopause, or from two to four years after the pregnancy to which the disease was attributed. There is ground, therefore, for believing that, in very exceptional cases, it may remain latent for a considerable period. As a rule the symptoms appear within a few months after the pregnancy, and frequently follow upon it almost immediately.

Three main varieties of structure have been found in deciduoma malignum: (1) In comparatively few cases, chorionic villi, with actively proliferating trophoblast, are embedded in the malignant mass. With these are associated two kinds of structure, generally in nearly equal proportion. One of these is the syncytium, the special characteristic of the growth. It consists of protoplasm in large branching masses, containing nuclei, but not differentiated into cells. It stains more deeply than other parts of the growth. The syncytium can often be traced as continuous with the proliferating syncytium or trophoblast of the villi. The second consists of masses of cells with large nuclei, often having karyokinetic figures. Sometimes, but not often, they can be traced as continuous with the Langhan's layer of cells beneath the syncytium of the villus. Masses of cells of identical appearance are seen in connection with the

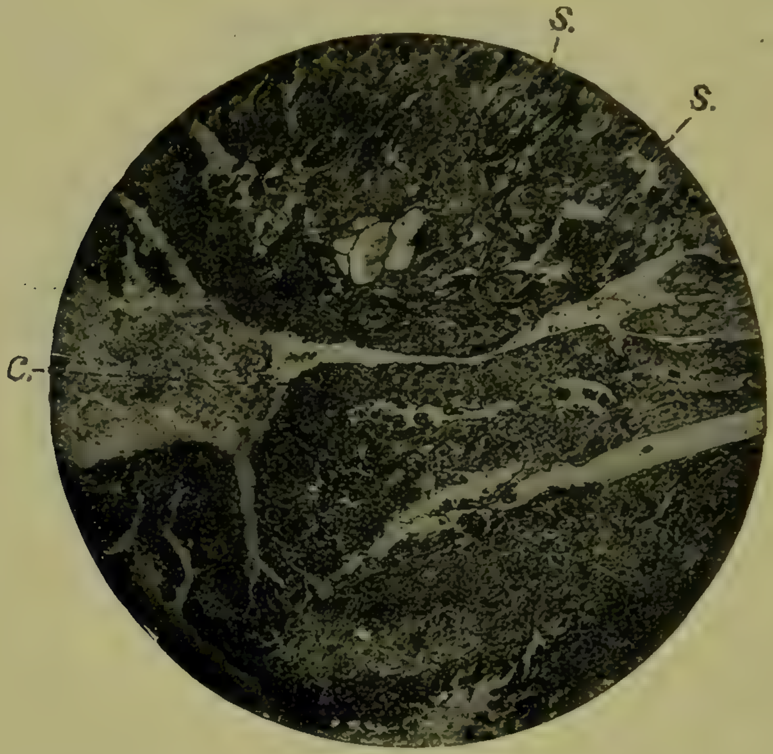

Fig. 231.—Deciduoma Malignum following Vesicular Mole.
s, syncytium; *c*, masses of differentiated cells. × 120.
(From a photograph.)

villi of very early pregnancy, and in vesicular mole (Fig. 230). I have found similar cell-masses, as well as proliferating trophoblast, in a carneous mole retained *in utero* five months after death of the embryo, without any suspicion of malignancy.

(2) The most common and most characteristic structure is a blending of syncytium with cell-masses without any actual villi (Figs. 231, 232). The syncytium often forms branching processes, forming lacunæ like those of very early pregnancy. In the typical part of the tumour there are no vessels amongst either cells or syncytium. The surrounding tissue seems to be broken down, large blood-spaces are often formed, and there is a great tendency to necrosis. In the infecting margin, however, small groups of cells or small masses of syncytium, even as small as single cells, appear to be springing up in the stroma, so that this part of the growth may approximate to the appearance of a sarcoma.

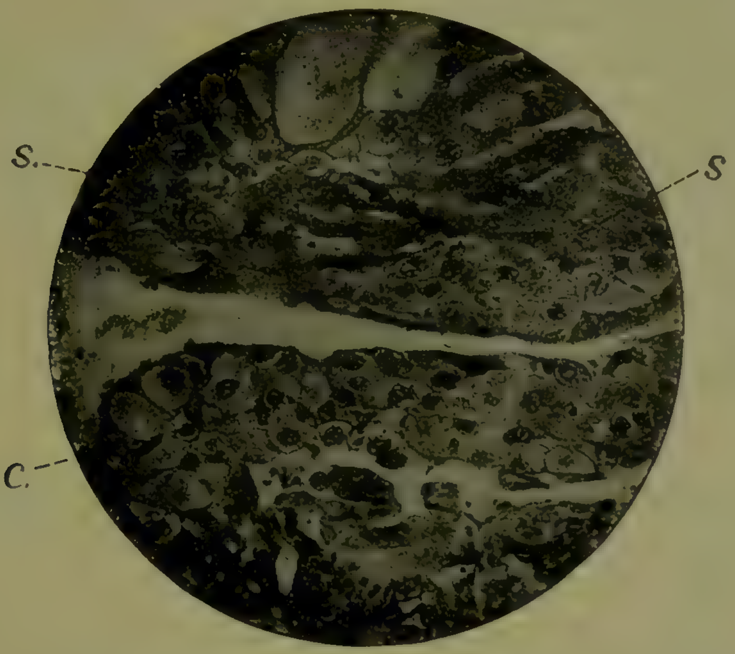

Fig. 232.—A part of the centre of Fig. 231 more highly magnified. The letters indicate the same as in the preceding figure. × 240.

(From a photograph.)

(3) In comparatively rare cases, generally of an advanced kind, where the patient has died from the disease without operation, no syncytium is found, or, at any rate, no large masses of it. Cells, with large nuclei like those in the cell-masses of the second variety, are seen scattered in the midst of a stroma, the general

appearance being that of a sarcoma. In some cases small masses of nucleated protoplasm are seen.

The proofs that the disease is really a chorion-epithelioma are that chorionic villi may retain their vitality and proliferating power long after the death of the embryo, even without malignancy; that the cell-masses and syncytium are identical in appearance with those seen in early pregnancy or vesicular mole; that where chorionic villi are present the syncytium of the tumour is continuous with the syncytium of the villi; and lastly, that in rare cases the appearance of a vesicular mole, or chorionic villi, have been found in the metastases.*

Some authorities think that cases having the third variety of structure are really sarcomata of the decidua, and so properly deserve the name of deciduoma malignum. But those among them which show small protoplasmic masses seem to indicate an intermediate form. Since they present exactly the same clinical features as the others, they may be only a further development. For as the growing margin of the tumour in class (2) approximates to the character of sarcoma, the whole growth might acquire this character if the more typical portions sloughed away. In favour of this is the fact that such structure has been found chiefly in advanced cases.

Most authorities think that the cell-masses are derived from the Langhan's or deeper layer of epithelium of the villus; they at any rate correspond in appearance to this layer, and direct continuity may sometimes, though rarely, be traced. But more often, as seen in vesicular mole, they appear to lie in continuity with the villus, but outside the layer of syncytium, as if they were formed by an extension from it. In a carneous mole retained five months *in utero*, I have found cell-masses in continuity with the villi, as well as proliferating syncytium, although no Langhan's layer could be seen. Both layers are now generally considered to be derived from the fœtal epiblast. In the earliest stage, the epiblast of the ovum, forming the trophoblast, is cellular, but its outer layer becomes syncytium when it comes in contact with maternal tissues. In the actively growing condition of the villi in early pregnancy, the epiblast covering them is divided into two layers—the Langhan's layer of distinct cells beneath, the syncytium on the surface. In the more advanced placenta, the syncytium only is seen. Both structures are, therefore, modifications of the epiblast, and it seems probable that they may be mutually convertible, and that proliferating outgrowths of syncytium may become differentiated into cells. This view is favoured by the fact that, in deciduoma malignum, intermediate conditions between syncytium and cell-masses may be seen.

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* *See* Apfelstædt and Aschoff, "Arch. f. Gynäk.," 1896, p. 511; Neumann, "Verb. d. Deutsch. Gesell. f. Gynäk.," 1891, p. 341.

An almost identical structure to that of deciduoma malignum, including metastases having a villous appearance, has been found in certain tumours classed as embryomata, which constitute a malignant development of a dermoid cyst. Such tumours have mostly been found in the testis or ovary, but one instance in the mediastinum has been recorded. Since such tumours resemble the imperfect development of an ovum into various tissues of the body, their occurrence is no argument against deciduoma malignum in the uterus being derived from an impregnated ovum. Probably they are instances of imperfect parthenogenesis, or attempted development of germ plasm, which normally should be concentrated in the testis and ovary, without union of the sexes. It is supposed that among the structures so produced is trophoblast, and that this gives rise to the characteristic appearances, as in deciduoma malignum.

The usual clinical features of the disease are its rapid progress and fatality; the appearance of early metastases both in the neighbourhood of the uterus and in viscera, as the lungs and liver; and the great tendency to hæmorrhage and necrosis.

But indications of metastasis have sometimes disappeared after removal of the uterus. Local metastases have been cured after imperfect removal. It is stated that those forms of growth are least malignant in which villi are present, this being probably the primary condition. Some of these have even been reported as cured by scraping out without removal of the uterus.

Pyometra Secondary to Cancer of Fundus.—Remarkable cases sometimes occur in which, generally after the menopause, the uterus becomes distended into a globular cavity containing pus, without any obstruction to the outflow through the cervix. To this condition, as well as to that in which the uterus is filled with pus, with occlusion of the cervix, the name of *pyometra* is applied. To the naked eye, at any rate, the appearance is that simply of inflammation of the uterine walls, but the cases are apt to run an apparently malignant course, and to end by perforation of the uterine wall, and the formation of a sloughy cavity among the intestines. In two cases I have found that, although microscopic sections showed for the most part merely infiltration with inflammatory cells, yet here and there evidences of malignant growth, sarcoma or carcinoma, in the uterine wall, could be detected. It would seem probable that in many, at any rate, of these cases the inflammatory condition is set up by the presence of cancer, although the symptom of hæmorrhage is absent.

Results and Symptoms.—In all forms of cancer of the body of the uterus the main symptom is usually hæmorrhage. Fœtid discharge occurs in carcinoma and round-celled sarcoma when disintegration of the surface has taken place, but is more usually absent in spindle-celled sarcoma, except at quite a late stage. Severe spasmodic or lancinating pain is an early symptom in many cases, but in others it is absent throughout or up to a late period, though usually present when surrounding organs are becoming infiltrated. In the latter stages cancerous cachexia becomes marked. The cancer may extend to the cervix, to all neighbouring organs, and by metastasis to different parts. It is liable also to break down into cavities which may penetrate the uterine wall, so that cyst-like spaces are formed, with gangrenous or semi-purulent contents. These may at first be limited by false membranes, but are apt to lead to perforation into the peritoneal cavity, and fatal peritonitis. Otherwise, death may be brought on gradually by hæmorrhage and exhaustion. The fatal result may also be due to peritonitis without perforation, to septicæmia, or to metastases.

Not unfrequently the disease runs a somewhat protracted course, extending, perhaps, to four or five years, and exceeding the average duration of cancer of the cervix. The symptoms are then for a long time limited to hæmorrhage, with perhaps some pain. In deciduoma malignum the patient is generally comparatively young. After a vesicular mole, abortion, or full-term pregnancy, irregular or continuous hæmorrhage may either continue without any free interval, or sometimes comes on only after two or three normal periods. In very rare cases the interval has been supposed to be as much as from two to four years; but there is the possibility that there may have been a later unnoticed abortion.

Diagnosis.—Carcinoma of the fundus uteri in its early stage is apt to be mistaken for a small fibroid tumour, and in its later stage for a fibroid tumour complicated by fixation due to peri-uterine inflammation. The differentiation may sometimes be made by the fact that in cancer there is generally a frequent recurrence of hæmorrhage during the intervals of menstruation, or a persistent blood-tinged discharge. Profuse hæmorrhage is also likely to be produced by the use of the sound, and the point of the sound will usually detect a rougher surface of the interior of the uterus in cancer than in fibroid tumour. A marked degree of pain, especially pain felt at night, occurs more often in cancer than in fibroid tumour.

The fact of the tumour commencing or growing rapidly after the menopause would be in favour of its being malignant: so, too, is the presence of ascitic fluid. If a soft fungoid mass, not being the product of conception, is felt within the uterus during the period of active sexual life, the probable diagnosis is that of round-celled sarcoma or deciduoma malignum.

The only certain mode of distinction, however, in the earlier stages of cancer is to remove a portion of tissue for microscopic examination. In all cases in which there is prolonged irregular hæmorrhage from the uterus, not accounted for by any morbid condition of the cervix, the uterine cavity should be explored. If the hæmorrhage has come on after the menopause, cancer is more probable than any other cause.

An anæsthetic should be administered and the cervix dilated at least up to No. 12 or 13 Hegar's dilator. If soft, friable tissue escapes spontaneously on the dilatation, the diagnosis of cancer is certain. If it does not, some pieces of tissue should be obtained from the endometrium with a sharp scoop: or ovum forceps may be passed up, to see if any polypoid projections can be caught with them. If the amount of tissue which can be removed does not seem more than fungoid endometritis would account for, the whole endometrium may be curetted, and caustic applied; the scrapings being reserved for microscopic examination. If the tissue is so abundant and friable as to suggest the probability of cancer, it is better not to meddle further than is necessary to obtain a sufficient amount of tissue for sections. Sometimes, however, abundant masses of tissue turn out to be only adenomatous hypertrophy; while scanty scrapings may prove to be cancer.

To enable any positive conclusion to be arrived at, the fragment should be large enough to allow sections to be made of it, after hardening, and the observer should have had experience in examining sections of uterine mucous membrane, healthy and diseased. In the early stage of cylindroid carcinoma the decision may be difficult. For there is proliferation of glands to a considerable extent in fungoid endometritis, and the diagnosis can only be made by the degree of deviation from the normal character of the glands, or, in the case of malignant adenoma, by the exuberance of the gland proliferation.

It is to be remembered too, that one criterion of malignancy in malignant adenoma, that of infiltrating the muscular wall, cannot be ascertained from scrapings. Hence, if the histological character is pronounced suspicious, and the symptoms recur after one or two curettings, it is advisable to remove the uterus, especially if the patient is near the menopause, still more if she is beyond it.

Cases are especially apt to be overlooked, in which cancer of the endometrium supervenes upon a fibroid tumour of many years' standing. If, in a case of fibroid tumour, irregular hæmorrhage is added to or supersedes menorrhagia, either the whole uterus should be removed, or its cavity carefully explored; and it should be remembered that a curette of extra length may be required to reach some parts of it.

While, in the early stage of cancer of the fundus, there may be no notable enlargement, in later stages it will be enlarged considerably, and evidence may be found of fixation by extension of the growth to surrounding parts, or there may be nodular masses outside the uterus.

In deciduoma malignum there will generally be a history of recent vesicular mole, abortion, or full-term delivery. In advanced cases there may be metastases about the vagina or vulva, or signs, such as hæmoptysis, pointing to visceral metastases.

Treatment.—If the diagnosis can be established while the uterus is quite movable, and there is no infiltration in the broad ligaments, total extirpation of the uterus affords a much better prospect of permanent cure than it does in the case of cancer of the cervix. As the disease often progresses rather slowly—more slowly than cancer of the cervix usually does—and may be long before it reaches the external wall of the uterus, it may remain for some time amenable to this treatment. Supravaginal amputation by abdominal section would not remove the whole of the diseased tissue with a sufficiently wide margin, since the attachment of the uterus to the bladder generally reaches up to or above the position of the internal os.

Vaginal hysterectomy should be chosen if the uterus is movable and not too much enlarged. As a preliminary, means should be taken to disinfect the interior of the uterus, and prevent cancerous material infecting the peritoneum or wound. The cavity may be washed out by means of a Budin's catheter with formalin solution, 1 in 500. In order to occlude the cervix, it may be transfixed, and tied in two halves with silk, Chinese twist No. 5, or the cervical canal may be plugged with a strip of iodoform gauze soaked in formalin solution.

The method of operation is the same as that described for the case of cancer of the cervix (*see* pp. 429–441). If the uterus is small, the fundus may be extracted in the same way by the production of retroflexion; but care must be taken, in fixing vulsella in it, not to lacerate it so deeply as to expose cancerous tissue. If the uterus is much enlarged it is better to draw it straight down; and then the clamp method (Fig. 225, p. 439) of securing the broad ligaments is the easiest.

If the fundus is very greatly enlarged, or if there are signs pointing to the probability of adhesion or extension outside the uterus, and yet there is hope of an operation being practicable, it is best to make an abdominal exploratory incision. Abdominal panhysterectomy is then carried out, if practicable, in the same way as for fibroid tumours (*see* p. 402). Extensions are not an absolute bar to the operation, provided that they are limited. I have obtained one cure of over five years, and apparently permanent, when there was extension to an adherent sigmoid flexure, which was resected; and another when half the growth had spread into the broad ligament, and had formed nodules upon the peritoneal surface. In the case of carcinoma complicating fibroid tumour, the abdominal operation is preferable unless the fibroids are very small. Vaginal hysterectomy by *morcellement* should not be carried out, lest the cancer be diffused, and the wound infected with it.

If the uterus is fixed, or the broad ligaments infiltrated, the treatment can only be palliative, especially for relief of pain. Any polypoid masses of sarcoma or carcinoma should be removed by the écraseur. In the absence of these it is better to interfere as little as possible with the interior of the uterus. In case of severe hæmorrhage, absolute rest should be enforced. The uterine cavity may be washed out by the aid of a Budin's tube with formalin, 1 in 500, or tincture of iodine ʒij. ad Oj. Or a large crystal of iron alum may be pushed up into the cavity. For the relief of fœtid discharge, the uterine cavity may be washed out with antiseptics, such as those used for cancer of the cervix (*see* p. 447), if this proceeding does not cause too much bleeding.

TUBERCULOSIS OF THE UTERUS.

Tuberculosis of the genital tract affects the Fallopian tubes most frequently, the body of the uterus next, the cervix more rarely, the vagina or vulva least frequently of all. It appears probable, therefore, that the infection is usually a descending one, and that the tubercle bacilli reach the peritoneal cavity through the circulation or in some other way, and thence enter the Fallopian tubes. In the majority of cases, tuberculosis of the genital tract is part of a more general disease, affecting the lungs, peritoneum, or other parts. In some instances the disease is limited to the genital tract. Still more rarely it affects the body of the uterus only, or the cervix only, while the tubes remain healthy. Some of these cases are attributed to local infection from a tubercular husband, since tubercular bacilli have been found in the semen in patients suffering from phthisis.

In the body of the uterus the disease begins in the form of miliary tubercles in the endometrium. Later, the endometrium is ulcerated and covered with caseating material, and the muscular wall is invaded.

In the cervix, also, the disease begins with infiltration with miliary tubercles. Later, shallow ulcers are formed, with a caseating surface or lined with tubercular granulations. In other cases papillary projections are produced. Thus a certain resemblance to carcinoma is the result. Sometimes the cervix is affected secondarily to the tubes, the fundus remaining healthy. More often the disease extends continuously from tubes to cervix.

Symptoms and Diagnosis.—In the early stage, tubercle of the uterus produces little or no symptoms, and, in the presence of phthisis, is not likely to attract attention. Later, the symptoms, both of tubercle of the fundus and that of the cervix, are a purulent or muco-purulent discharge, with occasional bleeding but less than that of cancer, and pain referred to the uterus. Often tubercle of the endometrium is only discovered on microscopic examination of the scrapings obtained by curetting. The diagnosis is often aided by the symptoms of tubercle in other parts of the body.

Tubercle of the cervix, if it occurs apart from phthisis or tubercle elsewhere, is apt to be mistaken for cancer. The uterus has been removed in consequence, and the nature of the disease only discovered on microscopic examination afterwards. Tubercle should be distinguished by the slighter degree of ulceration, and less tendency to bleed spontaneously or on touching. The only absolute distinction is to be made by detecting tubercle bacilli or the giant cells characteristic of tubercle in a fragment obtained by scraping or excision.

In other cases the uterus is found fixed, and surrounded by masses, or abscess cavities, evidently due to tubercular disease of surrounding parts.

Treatment.—No local treatment is generally of use when the disease is secondary to phthisis or tubercular peritonitis, or when the uterus is fixed.

If the uterus is movable, and the disease seems to be limited to the genital tract, the best plan, since the tubes are generally affected, is to perform abdominal section; and then remove uterus with tubes by abdominal hysterectomy, if no contra-indications are found. Cure of tubercle of the uterus has followed curetting and application of iodoform; but this method of treatment would not reach the tubercular tubes.

CHAPTER X.

DISEASES OF THE OVARIES.

MALFORMATIONS OF THE OVARIES.

THE ovaries may be congenitally absent, but this defect is almost always associated with absence of the uterus, and generally with want of development of the vagina, vulva, and breasts. More frequently, while the uterus is absent, the ovaries are developed. In the absence of the ovaries, a childish condition is generally perpetuated in the whole body, and the stature remains small, but in some cases there may be an approximation towards the male type. Sexual feeling is always absent or deficient.

Imperfect development of the ovaries is of much greater frequency. It may be associated with a rudimentary condition of the uterus, or, more frequently, with a small anteflexed uterus, and small vagina, while occasionally the uterus is well formed. Menstruation and the general changes associated with puberty are either deferred, or entirely fail to appear. Menstruation, when it does commence, is scanty and irregular, and is liable from slight causes to be arrested for a long period or permanently, while the menopause generally occurs early. General development frequently either does not proceed much beyond the childish stage, or the body is muscular, with a tendency to production of hair on the chin and legs, and frequently a harsh voice. The pelvis is often uniformly small or of a childish or masculine type. There is also usually a deficiency of sexual feeling, which may lead to unhappiness in married life.

Even if the development of the ovaries is only so far imperfect or retarded as to lead to the postponement of menstruation more than three or four years beyond the usual time, a serious permanent result may follow. If the growth of the pelvis does not receive that stimulus, which it usually derives at puberty from the development of the ovaries and uterus, until the age has passed at which the growth of the bones in general ceases, it is apt to retain permanently the childish type, and hence parturition may be obstructed if pregnancy ever subsequently occurs.

It is often very difficult to make an absolute diagnosis of imperfect development of the ovaries, for although defective development of the breasts, and of the feminine characteristics in the body generally, frequently coexists, yet this is not always the case. Even in the absence of such defects a probable diagnosis may be made in cases of prolonged amenorrhœa for which no other cause can be discovered, especially if there is a total absence of the periodical feelings of uneasiness in the pelvis, breasts, and system generally, which are termed the menstrual molimen, and if there is evidence of sexual indifference. If an anæsthetic is given, the ovaries may be felt bimanually, or without it if the patient is thin, and may be found to be smaller than usual.

Complete absence of the ovaries is difficult to distinguish from imperfect development, but may be diagnosed with probability if, in a not very stout woman, no trace of the ovaries can be felt on bimanual examination with the aid of an anæsthetic, if sexual feeling is entirely absent, and if, after a fair trial, all treatment fails to induce menstruation. All further treatment should then be abandoned.

Treatment.—Since imperfect development of the ovaries is generally only a probable diagnosis to account for prolonged or permanent amenorrhœa, its treatment will be considered under the head of Amenorrhœa.

ATROPHY OF THE OVARIES.

The physiological atrophy of the ovaries, which usually happens about the menopause, may occur prematurely, and lead to cessation of menstruation. This may be the result of acute ovaritis, or of pelvic peritonitis or cellulitis, more especially of peritonitis, from the effect of which the ovaries may be bound down in an abnormal position, and the natural liberation of the ovules prevented. Sometimes, also, it occurs without any local affection as the sequence of a serious illness, or from the effect produced upon the nervous system by a deep sorrow or other strong emotion. This is more likely to occur if the ovaries are from the first somewhat imperfect in development.

Treatment.—The treatment of atrophy, like that of imperfect development of the ovaries, will be described under the head of Amenorrhœa.

SUPPLEMENTARY OVARIES.

A supplementary ovary is sometimes suggested as an explanation of the continuance of menstruation, or the occurrence of pregnancy, after the supposed removal of both ovaries, but it is less frequently seen. The only kind of supplementary ovary which I have met with is a division of the ovary into two parts along the ovarian ligament, so that a piece of normal ligament intervened between the two. In one such case the distal ovary was the subject of cystoma, which it was possible to remove without interfering with the second ovary on the same side.

PROLAPSE OF THE OVARIES.

In a normal condition, the ovary rests as far forward as its attachments will allow it, although posterior to the plane of the broad ligament, being kept in position by the pressure of the intestines, which fill the fossa behind it. Its most notable displacement is one in which it drops below its normal level, and too far backward, descending into Douglas's pouch, and at the same time, owing to its attachment to the angle of the uterus by the ovarian ligament, is necessarily brought nearer to the middle line. The causes of this displacement are—(1) increased weight of the ovary due to hyperæmia, hyperplasia, or commencing degeneration of a cystic or any other kind; (2) laxity of the mesovarium, or of the broad ligament generally; and (3) retroversion, retroflexion, or prolapse of the uterus. By these displacements of the uterus the ovaries are necessarily carried backward and downward, and the coils of intestine which normally keep them in position are displaced.

Results and Symptoms.—Ovaries in this position are almost invariably affected by chronic hyperæmia or ovaritis, and not unfrequently they become fixed by inflammation of their peritoneal covering. The displacement, by rendering the ovary more exposed to pressure or traumatic influences, tends to promote or maintain the inflammation. Thus the symptoms of ovarian hyperæmia or inflammation are present, often in an acute degree, those specially intensified by the displacement being pain in defæcation and pain on coitus.

Diagnosis.—When thus prolapsed the ovaries can be reached more or less easily by the finger in vagina or rectum. When the prolapse is slight the examination must be made in the lateral position, and the finger, with its flexor surface towards the sacrum, must be carried as high as possible posterior to, and a little to one or the other side of, the cervix. The ovaries are recognized by their size and their shape, somewhat globular, but having often nodular irregularities. They are generally also more or less movable, and have a peculiar tenderness, analogous to that of the testicle. Often sickening pain, and not unfrequently hysterical manifestations, are produced when they are pressed. The ovarian ligament can often be recognized as a tight band running from the angle of the uterus to the ovary. Sometimes the Fallopian tube, especially if thickened, can be felt as a worm-like loop in the vicinity. In carrying the fundus uteri forward with the sound the displaced ovary is elevated to some extent. There may sometimes be a difficulty in distinguishing a prolapsed ovary from the retroflexed body of the uterus. The distinction may be made by restoring the uterus, if retroflexed, completely with the sound. An ovary, if present, will then still be felt posteriorly to the cervix, although generally elevated to some extent by the replacement of the uterus. If both ovaries are prolapsed, the double tumour makes the diagnosis more obvious. It is, of course, necessary to be careful not to mistake a mass of scybala in the rectum for a prolapsed ovary. In any case of doubt, digital exploration of the rectum will decide the point; and, if an ovary is only just within reach, it may often be more readily touched by this mode of examination than *per vaginam*.

Treatment.—When any degree of retroversion or retroflexion of the uterus is present, it is important to remedy that displacement, if possible, but the presence of the tender ovary frequently renders it difficult to adapt any pessary which can be tolerated, even after hyperæmia has been treated by rest and local depletion. In many cases, however, a Hodge's pessary may be found by trial, which will restore the uterus and elevate the ovary in some measure. A thick instrument should be chosen, or one having a broad cylindrical expansion at its posterior part, like that of Dr. Thomas (Fig. 146, p. 278). If this cannot be tolerated, an elastic ring pessary (Figs. 160, 161, p. 311) may prove useful. The general treatment should be that of ovarian hyperæmia and inflammation (*see* p. 479), special care being taken to render the fæces soft.

The question of removal of the ovary will be considered under the head of Ovaritis. An operation has been performed under the title of oophorrhaphy, for stitching the ovary up to the broad ligament, abdominal section having been performed as for the removal of the uterine appendages, and so keeping it in place. It is doubtful whether the result is likely to be permanent. At present, therefore, if abdominal section is justified at all, it appears to be wiser to remove ovary and tube altogether, provided that the other ovary can be left.

HERNIA OF THE OVARY.

The ovary may descend into a hernial sac, generally of the inguinal kind. A congenital, but very rare, form has been described in which one, or usually both ovaries, descend by a fault of development into the labium majus, or into a pouch of peritoneum which remains open in the inguinal canal, just as the testis descends into the scrotum in the male sex. The descended body is then generally irreducible, and other malformations of the genital organs often exist also. Acquired hernia of the ovary is generally associated with hernia of intestine or omentum, and is more likely to occur soon after delivery, when the attachments of the ovary are loose. The ovary is apt to become inflamed and degenerated in its abnormal position. In the case of an apparent hermaphrodite, a body of doubtful nature is more likely to be a testicle than an ovary. This holds true even if the external genital organs and general type are entirely feminine. Such cases appear to be usually instances of the rare condition of "transverse hermaphroditism," in which the external organs are female and the internal male. Thus, doubtful bodies congenitally placed in the inguinal canals or labia may be assumed to be probably testicles, unless either they are found to undergo regular enlargement at monthly intervals, or an unequivocally developed uterus is discovered.

Treatment.—An acquired hernia may be reduced, if possible, and its return prevented by a truss. In congenital or irreducible hernia, the ovary should be protected by a concave shield. If the ovary becomes inflamed, and causes very severe distress, it may be excised, an operation which has been found necessary in several recorded cases.

ACUTE OVARITIS.

Acute ovaritis (or oophoritis, as it has been called with greater philological propriety) is a rare affection. In its most severe form, leading to the formation of abscess, it is generally the result of septic absorption after delivery or abortion, and forms part of an acute inflammation of the broad ligaments and adjacent peritoneum. It may also, apart from parturition, be associated with pelvic peritonitis or cellulitis, especially, but not exclusively, with that of septic origin. Thus, in the case of pyosalpinx resulting from gonorrhœa, in which the tube is fixed by adhesion to the ovary and surrounding parts, one or more abscesses may be found in the ovary, secondary to the infection of the tubes. An abscess in the ovary may also follow operations on the uterus, intra-uterine application of caustics, or the use of intra-uterine stems. An abscess originating in ovaritis may in very rare cases run a chronic course and present signs similar to those of a small cystic tumour. It is much more common, however, for suppuration to occur secondarily to cystic disease. An abscess of the ovary may burst into the peritoneal cavity and lead to fatal general peritonitis.

A somewhat less acute ovaritis, not usually ending in abscess, may result from the extension of acute endometritis, especially that of gonorrhœal origin. The infection appears to extend directly to the ovary when it is embraced by the Fallopian tube at a menstrual period. The ovaritis may also arise through the medium of pelvic peritonitis, which is itself a common result of gonorrhœal inflammation. Cases of acute ovaritis have been traced to exposure to gonorrhœal infection, even when there has never been any manifestation of acute vaginal inflammation. Acute ovaritis, not usually leading to suppuration, may also occur in the course of specific fevers, such as small-pox. As the result of acute ovaritis the tissue may be so disorganized that ovulation ceases, and permanent amenorrhœa is the result. The subacute forms are apt to leave a chronic ovaritis behind, and sterility is a common consequence of the peritoneal adhesions which remain around the ovary.

Diagnosis.—The symptoms of acute ovaritis are often merged in those of the septicæmia, peritonitis, or cellulitis, with which it is associated, and this is almost always the case in the most severe forms of the disease. In cases, however, in which the ovaritis is the prominent feature, a diagnosis may be made from the localization of pain and tenderness, and from the recognition, on bimanual examination, of a rounded swelling, not usually movable, in the position of the ovary.

Treatment.—In the septicæmic form no special treatment can be directed to the ovary. In simple inflammation, when acute ovaritis forms the chief part of the affection, perfect rest should be enjoined, and leeches may be applied to the groin, round the anus, or to the cervix uteri. Poultices or fomentations should also be applied, and opiates may be given with iodide of potassium. If an abscess is suspected, special care should be taken to avoid any movement which might lead to rupture into the peritoneal cavity. A positive diagnosis of abscess limited to the ovary and not spreading in the broad ligament would justify abdominal section and removal of the ovary, but this can very rarely, if ever, be made in the acute stage. An abdominal exploration is, however, justified when there are general symptoms pointing to suppuration, and a localized rounded lump in the region of the uterine appendages. It is often impossible to tell with certainty till the exploration is made whether the pus is in the tube, or ovary, or both.

HYPERÆMIA OF THE OVARY AND CHRONIC OVARITIS.

Causation.—Since the ovaries, like the uterus, are naturally subject to a periodical active hyperæmia, this hyperæmia is easily rendered excessive by various causes, and may pass into actual inflammation. It is still more difficult than in the case of the uterus to draw any positive line between hyperæmia and inflammation, the ovaries being less accessible to observation. The tendency to ovarian hyperæmia is often a constitutional peculiarity of the individual, and is probably associated with excessive development of the organ, or of the sexual emotion on its mental side. It is generally found in women of an emotional and hyperæsthetic temperament, with frequently a predisposition to hysteria. Such women begin to menstruate early in life, and their menstruation is habitually profuse, until after marriage and parturition, by which it is often rendered more normal. Unless brought on prematurely by some cause of uterine or ovarian degeneration, the menopause generally occurs late.

The most important causes of reflex ovarian hyperæmia are morbid conditions of the uterus, which is more liable than the ovary to displacement, and to disturbances of menstruation dependent upon malformation, and is more exposed to traumatic influences. Chronic ovaritis may probably also be a sequel of chronic endometritis by direct extension of inflammation from the uterus along the Fallopian tube, without the occurrence of any acute ovaritis. When symptoms of obstructive dysmenorrhœa have existed from puberty, it is by no means uncommon for symptoms of congestive dysmenorrhœa, apparently ovarian in character, or those of chronic ovaritis, to be added after some years. In such instances it is impossible to determine whether reflex nervous influence only comes into play, or whether there is direct extension of inflammation from the chronic endometritis which generally exists.

Ovarian hyperæmia may also be produced by sexual excitement or excess. Masturbation, especially if practised before adult life is reached, or carried to excess (*see* p. 230), is undoubtedly one of the causes of hyperæmia, both of uterus and ovaries. A similar effect may result from imperfect coitus. This may be dependent either upon premature emission on the part of the husband, the result of former habits of masturbation or other causes, upon relative sexual frigidity or want of general vigour on the part of the wife, or upon the practice of the method of withdrawal as a precaution against pregnancy. Again, if women have masturbated in childhood, a too exclusive sensibility is apt to be cultivated in the clitoris. Vaginal coitus then frequently fails to produce the sexual orgasm, unless additional excitation to the clitoris is supplied. By the failure of the natural orgasm (analogous to the orgasm of emission in the male) on the part of the woman, which failure is by no means uncommonly habitual, the normal sedative to sexual excitement and congestion is removed. From such a cause, not only does local congestion arise, but, more especially, hysteria is apt to be produced.

Celibacy must also be reckoned among the causes of ovarian hyperæmia, since after marriage, menorrhagia, congestive dysmenorrhœa, and other signs of ovarian irritability are often relieved, even if pregnancy does not occur. But, on the other hand, chronic endometritis or metritis with sterility is often associated with ovarian hyperæmia or ovaritis, due in part to the want of that physiological rest to the ovary which is afforded by pregnancy. Swelling and tenderness of the ovaries are not unfrequently also found in women who have had children, sometimes apparently as the result of childbirth. They may then be the sequel of laceration or inflammation of cervix, retroflexion, partial prolapse, or other lesion of the uterus which may be the consequence of parturition. In these cases the affection does not usually show the extreme obstinacy which it often manifests in nulliparous women.

Passive Hyperæmia of the ovary is produced by general causes similar to those which lead to the same condition in the uterus, especially by constipation. When the ovary has once become prolapsed its venous circulation is further interfered with, and it becomes more exposed to direct causes of irritation. Passive hyperæmia renders the organ more vulnerable to causes of inflammation, and tends to produce hyperplasia and enlargement. From induration of the superficial tissue, the normal rupture of follicles may be interfered with, and inflammation thus secondarily set up, or the foundation of cystic degeneration laid. The importance of passive hyperæmia as a predisposing cause of chronic ovaritis is shown by the preponderance of that affection on the left side. This, like the usual occurrence of varicocele on the left side in the male sex, must depend upon the presence of the rectum and sigmoid flexure on the left side, whereby pressure upon the veins is liable to be produced, and upon the more indirect course of the left ovarian vein, opening into the renal vein instead of directly into the vena cava.

Inflammation of the ovary may result simply from an intensification of the reflex irritation which leads to active hyperæmia, or it may be produced indirectly by the hyperæmia leading to an excess in the normal slight effusion of blood on the rupture of a follicle, or hæmorrhage into degenerated follicles or ovarian stroma. The results of this may be irritation and inflammation either directly in the ovary, or primarily in the adjacent peritoneum, and secondarily in the ovary. Chronic ovaritis is also frequently the sequel of acute or subacute ovaritis, especially that of gonorrhœal origin. It is a common result again of pelvic peritonitis originating from tubal infection. either by direct extension of inflammation or from the obstacle to normal ovulation which thus arises, and the interference with the venous circulation. Apart from direct consequence of microbic infection by the tubes, or from adherent intestine, microbes may reach the ovary through the circulation, as in the case of specific fevers, including influenza, and set up inflammation there. Inflammation may also be set up by irritation due to the presence of follicles, either simply distended with limpid fluid or in a state of commencing cystic degeneration. Dr. Matthews Duncan declared his belief that the most frequent cause of chronic ovaritis is the use of alcoholic liquors, even when not taken to excess; and said that this view of the causation of the disease is frequently corroborated, if not proved, by the cure which follows upon the adoption of teetotal living.

Pathological Anatomy.—The process of ovulation leads to considerable changes in the appearance of the ovaries, and it is often difficult to determine how much deviation from the normal constitutes evidence of chronic ovaritis.

Microbic inflammation of the ovary is indicated by peritoneal adhesions. With these may be associated abscess in the ovary, or there may be merely infiltration of inflammatory cells extending into the ovary from the surface. Septic or gonorrhœal microbes are most commonly concerned. Pneumococci and the bacillus coli have also been found in ovarian abscesses, the latter making its way from the intestine, when the ovary is adherent to intestine.

The pathological proof of chronic inflammation in an ovary free from adhesion is often difficult. Probably the anatomical change is often not greater or more permanent than that which occurs when a testicle becomes swelled and painful from sexual excess. Clinically it is often found, on vaginal or bimanual examination, that a painful and tender ovary is enlarged, and that the enlargement subsides with the pain and tenderness. But often there is ovarian pain and tenderness when the ovaries are not enlarged and are even small.

One of two morbid conditions is often found when an ovary is removed on account of ovarian pain and tenderness. But it is not proved, as to either of them, that it is necessarily a cause of pain; on the contrary, similar ovaries are sometimes found when there has been no special complaint of ovarian pain.

In one the ovary is enlarged, partly by swelling of its stroma, but often to a great extent by the presence of small cysts containing clear fluid like the liquor folliculi but not being normal developing follicles. These appear to be due to degeneration of Graafian follicles, but do not tend to grow indefinitely, like cystic tumours. They are distinguished from cystoma by their containing a clear, not a thick mucoid fluid. and by their not being lined with a cylindrical epithelium. There may be hæmorrhages in the substance of the ovary, apart from the normal hæmorrhage into a ruptured follicle. Such hæmorrhage often occurs into the small cysts. It is said that the stroma may be infiltrated with round inflammatory cells, but often it is not easy to distinguish a departure from the normal in this respect.

In the other condition the ovary is smaller than normal, and often more corrugated on the surface. On section the substance of the ovary is hard, especially toward the surface; so on the section the edge of the tunica albuginea feels almost like a superficial shell. There are few developing Graafian follicles; and on microscopic section the most marked characteristic is the rarity of follicles or ovules visible in the cortical zone. The general stroma is denser than normal.

In both forms, but especially in the latter, the arteries near the hilum appear more numerous and more tortuous than usual, and have thickened walls.

It appears that the former variety is the earlier and the latter the later stage of a condition which may be variously regarded as chronic inflammation, or as congestive hypertrophy followed by fibroid degeneration. Doubtless, however, the latter may result without any stage of swelling if there is any general cause of fibroid degeneration present such as alcohol or other toxin.

Distinctions have been made between follicular and interstitial ovaritis, but they cannot practically be clinically separated. The small cysts above described may enlarge the ovary to a tangible globe from two to three inches in diameter. The cysts may undergo spontaneous cure by rupture, and absorption of the fluid by the peritoneum. Sometimes, on vaginal or bimanual examination, such a cyst may be felt to collapse on pressure. Generally no disturbance is set up.

Results and Symptoms.—Pain in one groin does not necessarily indicate ovaritis, but is a common result of uterine disease. But in ovarian hyperæmia or inflammation, pain in the groin, and extending down the thigh, is a marked symptom.

while there is also tenderness in the ovarian region, and the muscles on the affected side are rigidly contracted to protect the tender spot. Menorrhagia is a usual symptom, except in the later stage, when the ovary is atrophied, or when it has been severely damaged by acute inflammation. In other cases, however, the uterus may be imperfectly developed, or be in the cirrhotic stage of chronic metritis, and then menstruation may be scanty, while the insufficiency of the flow is in part the cause of the ovarian hyperæmia. A more extreme hyperæmia has sometimes been observed in cases of entire absence of the uterus. The pain in the ovarian region is usually aggravated in connection with menstruation, and the aggravation generally commences a few days or a week before the period. It is often relieved by the flow, provided that no cause of obstructive dysmenorrhœa coexists. If there are prolapse and enlargement of the ovary, pain on coitus is often a marked symptom, and in this case defæcation also is apt to be specially painful. In accordance with the physiological function of the glands of the cervix uteri and vulva, increased secretion of these glands, without any altered quality of the secretion, may be produced by ovarian irritability or undue sexual emotion. Such a condition, therefore, may be a cause of leucorrhœa, without any morbid change in the uterus itself.

The reflex nervous symptoms enumerated under the head of corporeal endometritis and metritis (*see* pp. 235–239) are still more marked, in susceptible subjects, in the case of ovarian hyperæmia or chronic ovaritis. The chief effects produced are nausea, vomiting, flatulence, or other gastric neuroses, pain under the left breast or at the top of the head, and, above all, hysteria. Hysteria, while largely dependent on constitutional proclivity, is commonly due, in the first instance, to some actual source of pain, which, in predisposed subjects, leads to such a state of irritability that after a time the slightest stimulus of a physical or mental kind is sufficient to evoke hysterical manifestations. The prime source of irritation is not necessarily in the sexual system, since hysteria may sometimes be induced before the age of puberty, or after the menopause, from the effect of a wound or injury. But in the hysteria of young adults, some source of irritation in uterus or ovaries, or some mental condition connected with the sexual emotions, such as a disappointment in love, or, in married women, an absence of perfect satisfaction in the marital relations, appears to be the commonest cause. In the extreme forms of hystero-epilepsy with hallucinations recorded by Professor Charcot, the connection with the ovary is reported as being a constant one.

It is probable also that, when uterine disturbance is the prime factor, reflex ovarian irritation is often an intermediate step in causation. Thus, in the not uncommon case of retroflexion and engorgement of the uterus, with prolapse of the ovaries, in a hysterical subject, nervous manifestations are usually more easily produced by pressure upon an ovary than by that upon the uterus. Hysteria is not necessarily the result of sexual excitement or sexual abstinence, for it may occur for the first time in a married woman as a sequel to uterine displacement, resulting from parturition, or to peri-uterine inflammation, as well as from causes altogether independent of the sexual system. But in the strong emotional susceptibility of hysterical subjects, the sexual emotion usually takes part; and this is often the case in a special degree when ovarian hyperæmia is the starting-point of irritation.

Diagnosis.—Pain, and even tenderness, on external pressure in the ovarian region is not sufficient ground for positive diagnosis. If a vaginal exploration be made very gently and carefully, it will be found that, although a general hyperæsthesia often exists, a special and extreme tenderness is manifested when pressure is made upon the ovary. If the ovary is more or less prolapsed, so as to be reached by the finger in the vagina somewhat behind the cervix, this tenderness is easily recognized, and the ovary is often felt to be enlarged and nodular. If not, the ovary may often, on bimanual examination, be caught between the two hands in its normal position, and made out to be enlarged and tender, but generally movable. Sometimes the rigidity of muscles prevents this, and, unless an anæsthetic be given, nothing more than increased resistance and excessive tenderness localized in the ovarian region can be detected. Frequently rectal exploration allows the finger to reach the ovary more fully than is possible by vaginal touch.

Treatment.—All postural causes of passive hyperæmia, such as prolonged standing or sitting, should be avoided. Long-continued practising on the piano, and, still more, playing on the harmonium, or the use of the treadle sewing-machine, are especially injurious. Any sources of undue emotion should be removed as far as possible. It is of importance to relieve the portal system and render the fæces soft by saline laxatives, and it is often of advantage to secure an action of the bowels in the evening, that there may be no source of venous congestion during the night.

In married women, strict moderation in coitus should be enjoined, but in ovarian hyperæmia temperate use of the sexual function is generally more salutary than total abstinence, except for a limited time, provided that no sufficiently acute inflammation is present to cause distress in intercourse. If coitus gives no satisfaction to the wife, it is more apt to be injurious, and still more if it causes pain.

Ovarian pain is generally relieved, at any rate temporarily, by complete rest. But, as the subjects of it are often neurotic, caution must be used about enjoining too prolonged rest, lest they become chronic invalids.

In the case of a married woman, worn out with household cares, especially if the ovarian pain has followed a confinement, rest in bed away from home, in a hospital or nursing home, affords great relief. But it should not be prolonged beyond two months at the outside. In the ovarian pain of unmarried women, a shorter period of complete rest is generally preferable. When uterine inflammation coexists with ovarian pain, it is often advisable to treat the uterine condition first, for the uterus is more vulnerable and also more easily reached by remedies. The uterus may have suffered from infection or traumatism, and the ovary be affected only by reflex congestion. In such cases, the ovary is likely to get well spontaneously if the uterus is cured. In case, therefore, evidence is found of endometritis, inflammation or laceration of cervix, or backward displacements of the uterus, these conditions should first be treated.

If local pain and tenderness are severe, they may be relieved by depletion of the cervix uteri, and in this case leeching is more effective than puncture. The effect, however, is not so direct as in the case of hyperæmia of the uterus; and the depletion should not be too often repeated, lest it have deteriorating effect upon the general health. Counter-irritation is usually preferable to depletion, and may be carried out by the application of blistering fluid to the groin over the tender regions, repeated at intervals. In milder cases the liquor iodi fortis may be painted repeatedly over the same spot of skin, as long as it can be tolerated. Dr. Barnes recommends, as a still more efficacious counter-irritant, the application of caustic, such as the potassa fusa cum calce, to the cervix uteri (*see* p. 209). The application of liquor iodi fortis or Churchill's tincture of iodine, is a less severe measure. Counter-irritants often tend also to relieve reflex nervous symptoms, such as vomiting, the second impression having apparently an inhibitory effect upon the primary irritation. To relieve reflex vomiting it is often best to apply the counter-irritant over the epigastrium.

Of internal remedies, the most valuable for curative effect are the iodide and bromide of potassium. The former, when long-continued in sufficient doses, tends to cause atrophy and absorption of ovarian as of other glandular tissues. Bromide of potassium relieves active hyperæmia of the pelvic organs in general, and acts also as a sexual sedative. It is also better tolerated for a long period than iodide of potassium. Bromide of strontium is recommended for cases in which bromide of potassium is found too depressing. Bromide of ammonium or sodium is also useful in these cases. When gastric and intestinal neuroses are present, these drugs may be combined with bitter stomachics and laxatives.* Small doses of perchloride of mercury, administered for a long period, may also be tried as an absorbent (*see* formula, p. 242).

In the more chronic stage, a general tonic treatment is desirable, especially for the cure of the nervous or hysterical symptoms, which often persist after the prime irritant cause has in great measure been removed. Cold baths are specially efficacious, and when aided by the change of scene afforded by a course of treatment in a hydropathic establishment, have often an additional effect. Sometimes sea-bathing, or the addition of salt to the baths, proves still more beneficial. Cinchona or quinine may be combined with bromide or iodide of potassium. Iron must be avoided if any considerable menorrhagia, or active hyperæmia, is present, but for the cure of nervous symptoms it is of great value, and it is specially useful if menstruation is scanty. It is often better borne if combined with bromide of potassium, and a laxative should be added if necessary. Alcohol should be used sparingly, and all sedatives, and especially opiates, should be reserved as much as possible for paroxysmal attacks, when they may be used in the manner described under the head of Congestive Dysmenorrhœa. Great relief, at such times, is afforded by warm hip-baths, and still more efficacious is the whole bath, in which the patient should remain for a considerable period. Poultices or fomentations may also be employed when pain is acute. The use of alcohol for the relief of any nervous symptoms, or at any other time than with meals, is specially to be discouraged.

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* The following is a useful formula :—℞. Magnesiæ sulphat. gr. xxx.; potass. bromid. gr. xx.; tinct. gentianæ co. ʒj.; aq. ad ℥j. ter die.

Massage.—In some cases of chronic disorders of uterus and ovaries, but more especially of ovaries, the neurotic element largely preponderates. With an amount of local disease which would not be more than sufficient to cause slight discomfort to an ordinary person, a woman may be totally disabled from active life, and may even spend years as a bed-ridden invalid. In this condition of so-called "neurasthenia," loss of appetite and failure of nutrition are often marked symptoms. A patient may become excessively emaciated, and may even die from exhaustion, if some slight ailment supervenes. In such cases the treatment by massage and feeding, introduced by Weir Mitchell, has often given good results. It is most successful where the prominent feature is loss of appetite and emaciation. If the nutrition of the body is once restored, the tone of the nervous system may then be permanently regained. It is less successful in hysterical cases, where there is little or no loss of flesh, though it may sometimes do good even in these. But not unfrequently the patient is merely fattened for a time, and eventually relapses into her old condition.

The principle of the treatment is to ignore all local pelvic maladies. The patient is removed from all her friends, and placed in the charge of an experienced nurse, and of a masseuse. She is kept in bed during the greater part of the treatment, which lasts from six to eight weeks, and all working or reading is forbidden. Care should be taken that the teeth are in good order, and deficiencies supplied if necessary, before the commencement of the treatment. The whole body is shampooed for an hour or two twice a day, and Faradization may be used in addition. The object is to stimulate appetite and nutrition by the passive exercise thus given to the muscles. Nourishing food is given at short intervals, and a rapid increase of flesh is generally obtained. After the completion of the course, a month should be spent at the seaside with a nurse; and an effort made to cast off invalid ways. For details of the treatment, Weir Mitchell's book, "Fat and Blood, and How to Make Them," and Playfair's "The Systematic Treatment of Nerve Prostration and Hysteria," should be consulted.

Oophorectomy. — Removal of the uterine appendages for chronic inflammation of the ovary, as well as for that of Fallopian tubes, has been recently much practised. In the hands of practised specialists, the operation is now one of very slight risk, and its scope is therefore with justice extended; but it can hardly be doubted that it has often been performed without adequate reason in cases of dysmenorrhœa, or complaint of severe pain in hysterical women.

The simplest case is that in which there is prolapse of one ovary, with enlargement, and symptoms and signs of chronic inflammation of the displaced organ. If other treatment fails to give relief, and the patient is a chronic invalid, or for a long time seriously disabled for the duties of life, the affected ovary, with the corresponding tube, may be removed. The same operation may be performed for chronic ovarian pain limited to one side, even without prolapse, especially if that side is the left. Sometimes it will be found unexpectedly, even in the case of a virgin, that there are adhesions about the appendages. It is, however, a drawback to the operation that removal of one ovary appears to have a tendency to produce congestion of the opposite ovary. Thus a temporary cure may result, but pain reappear on the opposite side after the interval of a year or two.

If inflammation of the ovary only forms a part of disease of the tubes and chronic pelvic peritonitis, these latter conditions generally outweigh it in importance, and it is upon them that the question of removal of the uterine appendages should depend. It is but rarely that removal of both ovaries and tubes is justified in the case of chronic ovaritis, not complicated by pelvic adhesions or distension of the tubes. It may be so in some extreme cases, in which the usefulness and enjoyment of life are entirely destroyed by symptoms which are believed to be referable to morbid ovulation, especially if the patient is in such a position that she has to earn her own living, and is disabled from doing so. If a woman is single and no longer very young, and it is reasonable to suppose that her chances of marriage are remote, the considerations which should generally tell against complete removal of the uterine appendages are of less weight.

In general, removal of the ovaries cures the pain, although it may have an unfavourable influence on the nervous system in other respects. But I have known neurotic subjects to declare the pain to be as bad after the operation as it was before. The younger the patient, the greater of course is the objection to the removal of both ovaries. In young patients, also, the nervous effects of the menopause, artificially established, are apt to be more severe than usual.

The mode of performing the operation for removal of uterine appendages, and the general conditions which are required to justify it, will be described under the head of Diseases of the Fallopian Tubes.

CYSTOMATA, OR CYSTIC TUMOURS OF THE OVARY.

Causation.—Cystic tumours are the most frequent and important of new growths in the ovaries. The origin of cysts in this situation, as in other places, has been attributed by some to the formation of a space in the interstices of the stroma, or to the enlargement of a single cell. The special frequency, however, of cysts in an organ which normally contains physiological cysts, namely, the Graafian follicles, and the rarity of the commencement of ovarian cysts except during the years of active sexual life, are sufficient to indicate that, in the great majority of cases at any rate, the cysts originate from abnormal growth either of the actual Graafian follicles, or of the embryonic structures from which they are developed, and are therefore a form of adenoma. In multilocular tumours the ovum or its remnant has actually been detected by Dr. Ritchie and others in many of the smaller cysts, the size of which does not exceed that of a cherry, and the contents are a limpid fluid, and thus the mode of origin of the cysts is demonstrated as regards these instances. In the larger cysts, and those having colloid contents, the ovum can never be detected, and even the smallest cysts differ from the more developed Graafian follicles in the fact that their lining epithelium consists of a single layer of cells.

It is maintained by Waldeyer and also by De Sinéty and Malassez that ovarian cystomata are not developed from Graafian follicles at all, but from ingrowing epithelial processes or tubes derived from the surface epithelium of the ovary, from which epithelium the ova themselves are developed. It is supposed that many cystomata have their origin in fœtal or very early infantile life by a deviation from the normal process of formation of Graafian follicles out of epithelial processes of this kind, and that there may be also an abnormal development of processes from the surface epithelium in later life. De Sinéty and Malassez describe the ingrowths as having a glandular form, resembling cylindroid carcinoma (*see* p. 451). I have found a similar glandular growth commencing from Graafian follicles, every stage being visible from that of a single pouch or diverticulum in the wall of the otherwise spherical follicle. It would seem, therefore, that cystomata may originate either from a very early stage in the development of Graafian follicles, as is probably the case with cysts containing mucoid or colloid fluid, or from somewhat more advanced follicles. Small colloid cysts may be found in the ovary even at birth, but appear usually not to undergo enlargement before the age of puberty.

Nothing certain is known as to the cause of commencement of cystic growth, but it is probable that in some cases it is due to fibrous hyperplasia of the ovary—usually the result of previous hyperæmia or ovaritis—or to adhesions of the surface, preventing the maturation or rupture of the follicles, or to their becoming developed too far from the surface to allow of their reaching it. It is possible that the premature death of the ovum, by preventing maturation of a follicle, may lead to cystic degeneration. In the normal condition, however, many follicles become atrophied without ever having ripened, and this cannot therefore be the sole condition present. It is possible, again, that the failure of the follicles to rupture may be the result of an insufficient menstrual hyperæmia in the ovary, such as occurs in chlorosis and other forms of anæmia.

The essential change associated with the tendency of the cyst to unlimited growth, is the conversion of its lining into a glandular character, from the epithelium assuming the cylindrical or columnar form. But the cause of the change of the epithelium is unknown.

Pathological Anatomy.—*Varieties.*—Cystic tumours of the ovary may be divided according to their original position into cysts of the oophoron, or cortical zone of the ovary which contains the Graafian follicles, and cysts of the paroophoron, or hilum of the ovary, consisting of the cellular tissue stroma and vessels. The latter cysts are believed to arise from the tubes of the parovarium which are continued into the hilum of the ovary from the broad ligament.

According to their structure, non-malignant cystic tumours of the ovary may be divided into (1) simple cysts, which may be single, paucilocular, or multilocular; (2) proliferous cysts or cystic adenoma; (3) papillary cysts; (4) cysts which are both papillary and adenomatous; (5) dermoid cysts.

An important practical distinction is to be made between tumours consisting mainly of one, or of a very few, large cysts, and those made up of a great number of small ones. It is very rare, however, for a true ovarian cyst to be actually unilocular, and the two classes are rather to be termed paucilocular and multilocular cysts. At an early stage of degeneration the cysts are almost invariably multiple, and the large cyst generally arises by the breaking down of the partitions between a number of smaller ones, or by the growth of one cyst at a very much more rapid rate than the rest. Thus a large number both of paucilocular and multilocular tumours are merely aggregations of simple cysts.

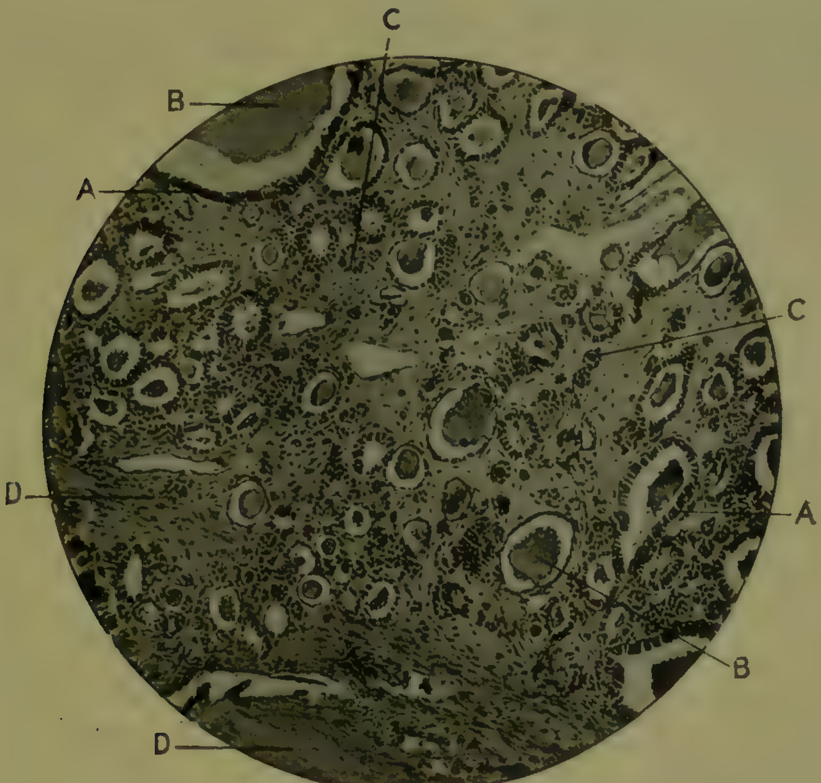

Fig. 233.—Cystic Adenoma of Ovary with Colloid Contents.
A, Cylindrical epithelium lining cyst; B, colloid contents of cyst; C, glandular proliferation; D, connective tissue stroma.
Micro-photograph by Dr. E. S. Worrall.

From these are to be distinguished the *proliferous cysts*, in which there is a further departure from the normal conditions of growth, and an approximation towards malignancy. In these tumours secondary cysts are formed all over the walls of the primary cysts, instead of being merely developed out of the primary ovigenous layer. The growth is at first of a glandular
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character, and constitutes a *cystic adenoma*. The epithelial lining dips into the cyst wall in the form of crypts, and these become closed cavities which are afterwards distended by secretion. Some describe the glandular formations as commencing in the form of a closed cavity, beneath the superficial epithelium.

In the smaller cysts the epithelium is cylindrical. In cysts containing colloid fluid it is often a very tall cylindrical epithelium, showing goblets. In the larger cysts it becomes shorter and more cubical; in very large ones it is flattened, or may be lost altogether from the effects of the fluid pressure.

In another variety of proliferous cyst the proliferation takes the form of a growth of papillary processes from the cyst-wall (Fig. 234). These are covered at first with cylindrical epithelium, which becomes irregular and multiform in its proliferation, and is often heaped up in projecting masses, like bunches of grapes, which are easily detached. On rupture of the cyst, either from excessive papillary growth or any other cause, the exuberant epithelium becoming detached may convey cancerous infection to the peritoneum. This form of growth has been called *cystoma proliferum papillare*. At the same time the depressions between the papillæ may tend to invade the tissue beneath in the form of branching glandular crypts. Thus is formed a tissue, at first adenomatous, identical with that which appears to be the first stage in the formation of proliferous cysts. It may either be sharply limited, or may invade deeply the connective or sarcomatous tissue between the cysts. In general, the papillomatous outgrowth preponderates over the cyst formation.

If the glandular epithelium loses its typical character and invades the connective tissue stroma, a glandular carcinoma results, in the same way as it is formed from a tissue originally glandular, such as the endometrium.

It has been supposed by some that the secondary cysts are generally formed by the union of adjacent papillæ, and this view was maintained by Dr. Wilson Fox. But the probability would be greatly against papillæ so uniting as to form a completely closed cavity, and practically cysts containing papillary growth are markedly distinct from those containing glandular or cystic growth. The view of Doran and Bland Sutton has been generally accepted in this country that papillary cysts of the ovary arise in the paroophoron, not in the oophoron, and originate from portions of the tubes of the parovarium which are embedded in the ovary. Against this is the fact that while the main part of the parovarium is in the broad ligament, papillary cysts are commoner in the ovary than in the broad ligament, and that the more usual cysts of the broad ligament containing clear fluid of very low specific gravity, which used to be regarded as parovarian, do not generally contain papillary growths. It is certain that papillary cysts do not exclusively originate in the paroophoron, for I have found such cysts at a very early stage, near the surface of the ovary, at the opposite pole to the hilum.

Some foreign authorities consider that papillary cysts originate either from the Graafian follicles or from ingrowths of the germ epithelium on the surface. The fluid contained in them is generally not the thick viscid fluid of high specific gravity (1030-1060), containing paralbumen or pseudo-mucin, but a clearer serous-looking, and less viscid fluid of moderate specific gravity, (1010-1020), and containing albumen. According to Pfannenstiel, there is an essential difference in the epithelium, that of the ordinary adenomatous cyst being cylindrical and resembling the cells of mucous glands, that of the papillary cyst being ciliated columnar epithelium. Papillary cysts are rarer than adenomatous

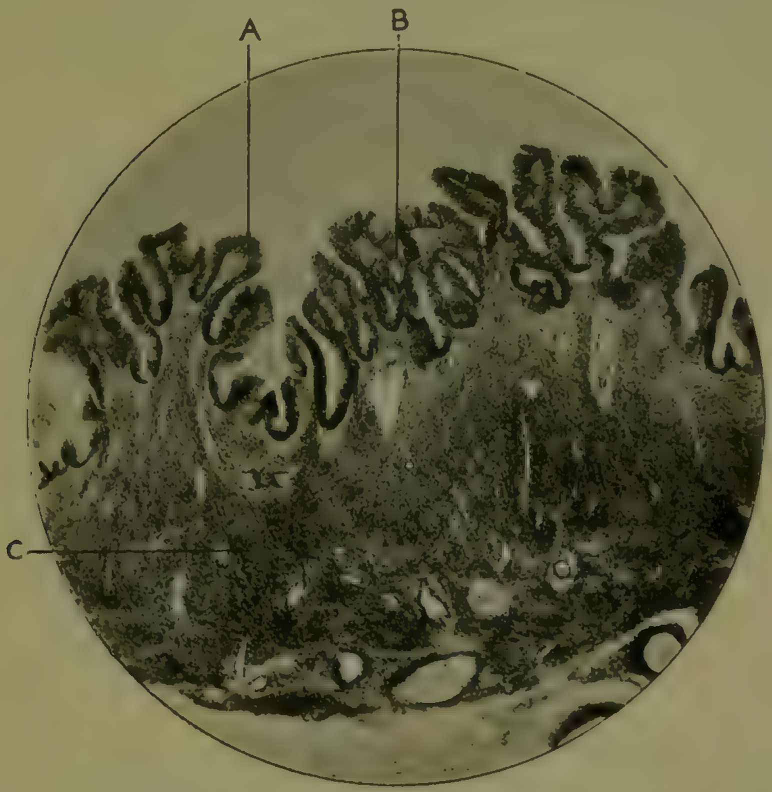

Fig. 234.—Wall of Papillary Cyst of Ovary.
A, Papillary outgrowth ; B, adenomatous ingrowth.
Micro-photograph by Dr. E. S. Worrall.

cysts, in the proportion of not more than 1 to 8. They have a special tendency to be bilateral, this being one of the indications in them of a tendency towards malignancy. The most probable conclusion is that they may originate either from the tubes of the parovarium, or in the same manner as other ovarian cysts.

If a papillary cyst ruptures, the papillary growths may grow outward through the opening, and increase to a large size. They may spread over the surface of the ovary and adjoining parts, and papillary growths may spring up by metastasis in the adjacent peritoneum. Sometimes the papillary growth penetrates the cyst wall, even without any rupture, and appears on the surface of the tumour. Occasionally papilloma commences on the surface of the ovary, without any preceding cyst.

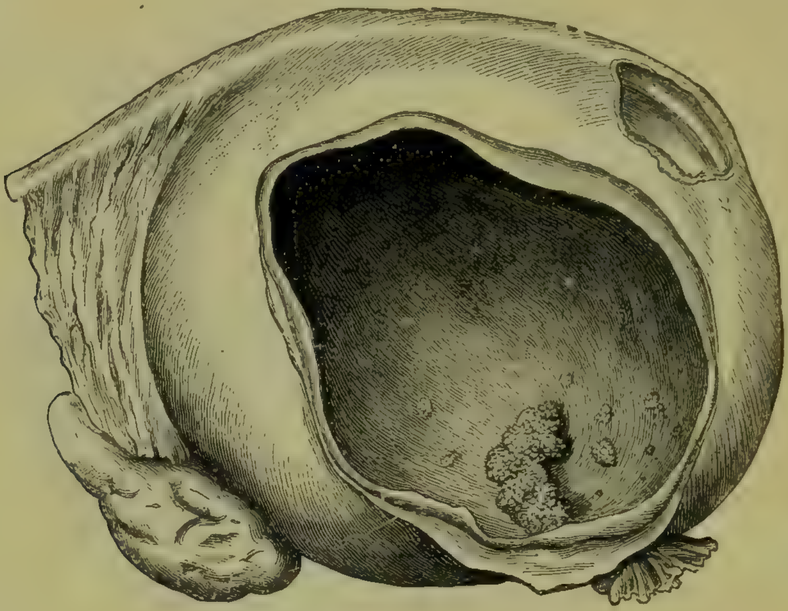

Fig. 235.—Papillomatous Cyst of Ovary (Doran).

The cyst is situated at the hilum of the ovary, and the greater part of the ovary is seen to remain separate from it. The cyst lies deeper in the broad ligament than an ovarian cyst generally does, so that the Fallopian tube is stretched over three-fourths of its circumference.

The growth may retain the character of simple adeno-papilloma, or the stroma may become infected by atypical epithelial cells. In accordance with the varying structure, the degree of tendency to malignancy varies in different cases. Sometimes, after removal of the original tumour, even a scattered metastatic papilloma of the peritoneum may die out, and the patient remain permanently cured. More often the growth runs a malignant course. I have known a young girl die within three months of cancerous peritonitis, when a papillary cyst had been removed, leaving the peritoneum affected by papilloma.

The cyst-walls of an ovarian cystoma are covered on their peritoneal surface with an epithelium like that of the normal surface of the ovary, a short cubical epithelium; or, in part, when the tumour has separated the layers of the broad ligament, by the ordinary peritoneal epithelium. The structure of their substance is of the connective tissue type, and varies from a fibrous or areolar tissue with few nuclei, such as is found in the walls of large and slowly growing cysts, to a more vascular and imperfectly formed tissue, which must be regarded as sarcoma, generally of the spindle-celled variety. By rapid growth of this tissue the thickness of the cyst-walls may become great in proportion to the dimensions of the cysts; and when the proportion of this solid matter is considerable, the tumour becomes a *cysto-sarcoma*. In proportion to the relative amount of solid material is the tendency towards malignancy in the tumour, and this is more manifest if the tissue has anywhere the character of round-celled sarcoma. Such form of growth frequently affects both ovaries together, and it tends to invade other tissues, when adhesions have occurred, and to recur in the pedicle, or by metastatic deposits, after removal. That, in comparison with other sarcomata, it does not earlier show a malignant character, and that it may be eradicated if removed early enough, probably depends upon the isolated position of an ovarian tumour, while free from adhesion.

The contents of the cysts vary from a gelatinous or colloid substance, which will not flow through a canula, to a clear and limpid fluid. In most cases the fluid is somewhat viscid, and its colour is often brownish or greenish. In the multilocular, and especially in the proliferous cysts, the fluid is usually more gelatinous. Frequently it varies greatly in the different cysts of the same tumour, and generally it is more viscid or gelatinous in the smaller cysts than in the larger. The more viscid fluids contain albumen and its derivatives, also paralbumen, lately called pseudo-mucin, metalbumen, and peptone. They also contain a considerable proportion of mucin. This is distinguished from the albuminous series of substances by its not being precipitated from its solution by tannin or by neutral metal salts, and by its swelling up in water. The so-called *colloid* tumours are made up of a number of very small cysts containing colloid or mucoid fluid. In some cases cysts filled with gelatinous material rupture even while comparatively small, apparently from the tension produced by the abundant production of such material, which may then be found free in the peritoneal cavity. When this is the case secondary colloid degeneration in the omentum and other parts is apt to result. In some such instances gelatinous material is found not only in the cysts but among the fibres of the cellular tissue of the tumours, a condition which seems to be a further indication of a tendency toward malignant infection of adjacent parts. A clear limpid fluid, of specific gravity below 1010, containing only a trace of albumen, may be found in a true

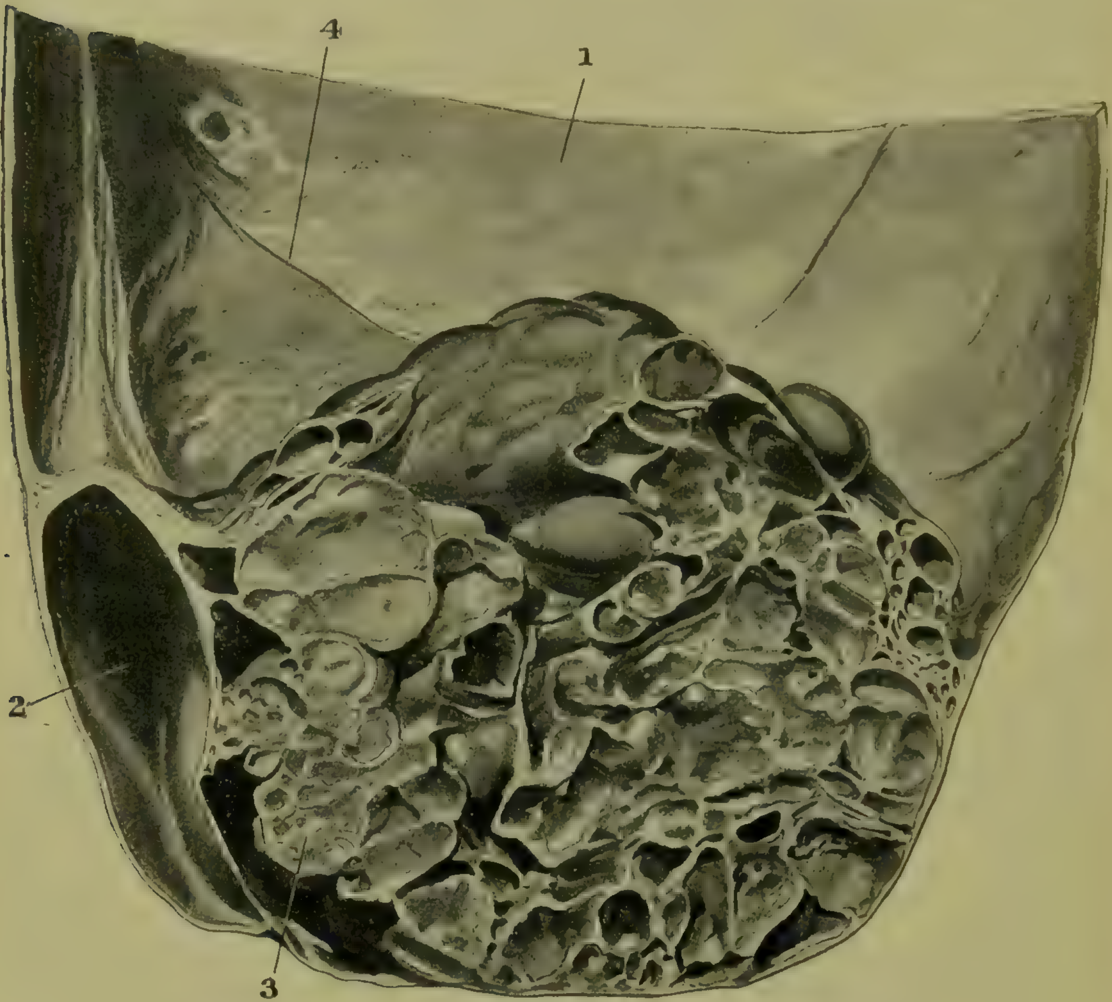

Fig. 236.—Portion of a large Multilocular Ovarian Cyst (Cystic Adenoma).

Section of a portion of a large ovarian cyst, showing the wall of the main cyst, and at its lower border a mass of smaller secondary cysts of great complexity. The smaller cysts contained clear thick mucoid material, and are lined with columnar (glandular) epithelium. The tumour is a simple cystic adenoma of the ovary. 1, Main cyst wall; 2, secondary cyst cavity; 3, mass of smaller honeycomb cysts contained within the main cyst wall; 4, septum, showing remains of a cyst which has opened into the main cyst cavity.

After Hubert Roberts, "Outlines of Gynæcological Pathology," Fig. 86.

ovarian cyst, and even, in rare cases, in the several cysts of a multilocular tumour. If, however, a cyst containing such fluid is unilocular, it is more likely to be of parovarian, or broad ligament origin (*see* p. 493). A special and very rare form of multiple ovarian cyst has been called Rokitansky's tumour. It is most frequently bilateral, and is made up of innumerable small cysts, which have the character of dilated Graafian follicles, and in some of which ova may be found. In general there is no evidence of adenomatous proliferation, but intermediate forms between this and the ordinary cystic adenoma have been described.

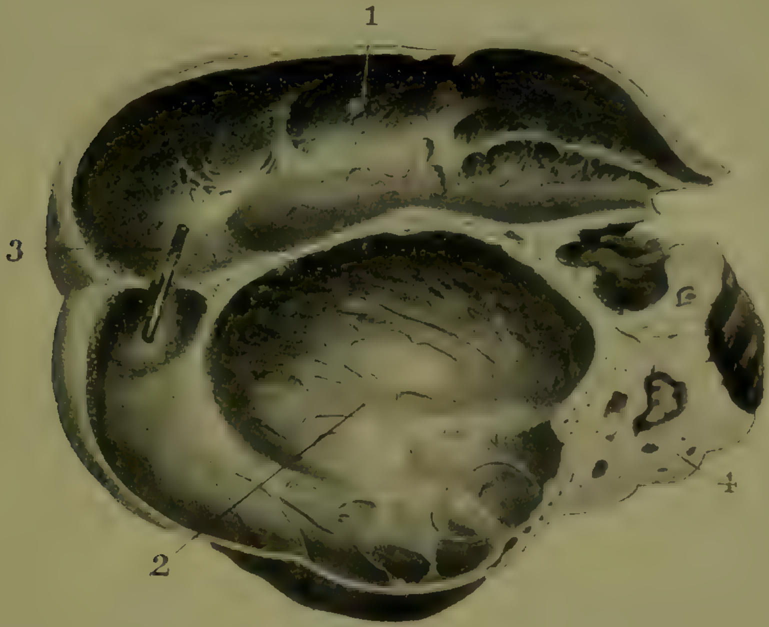

Fig. 237.—Tubo-ovarian Cyst.

One half of a dilated Fallopian tube and a small unilocular cyst of the ovary. The extremity of the tube is adherent to the ovarian cyst, and communicates with it by means of a minute orifice through which a glass rod (3) has been passed. 1, Much-dilated Fallopian tube; 2, unilocular cyst of the ovary; 3, small orifice of communication between the tube and the ovary; 4, remains of normal ovarian tissue.

After Hubert Roberts, "Outlines of Gynæcological Pathology," Fig. 112.

In some instances the fluid of a cyst has escaped through the uterus, and such a discharge may happen on repeated occasions. In such cases the cyst is generally a *tubo-ovarian* cyst, which is described as originating in the following manner: —A Graafian follicle ruptures while the point of rupture is enclosed within the pavilion of the Fallopian tube, adherent at its margins to the ovary; the communication between the follicle and the tube fails to close, and the follicle undergoes cystic dilatation; the pavilion, or a portion of the canal, of the tube then contributes to the formation of the resulting cyst, and the tube generally allows the passage of fluid only occasionally. A pseudo-cyst may also be produced by adhesion of the pavilion of the tube to the ovary, and distension of the cavity by serum or pus, or an ovarian cyst may rupture into the dilated extremity of the tube, adherent to the ovary previous to the formation of the cyst.

In all these cases the tubo-ovarian cyst is situated at the end of the tube. When, however, an ovarian cyst begins to form while the tube is free from adhesion, the fimbriated extremity of the tube is always turned outward. If the tube afterwards becomes occluded and distended, and a communication is formed between it and the ovarian cyst, another pattern of tubo-ovarian cyst arises, in which the communication from the ovary to the tube is a lateral one.

A dilated tube, taking the shape of a retort, when the outer end of the tube is much more dilated than the inner, may simulate a tubo-ovarian cyst. In some of these cases, the narrow part of the tube opens quite suddenly into the dilated extremity; and the diverging longitudinal ridges of the tube at this spot much resemble a damaged fimbriated extremity. Sometimes, therefore, it is only by finding the ovary separate from the cyst that it is possible to distinguish such a case from a tubo-ovarian cyst.

A few cases have been recorded in which simple cysts containing limpid fluid have been found attached to the peritoneum without connection with the ovary, and these have been ascribed to cystic growth of an unimpregnated ovum, which had become attached to the peritoneum like the ovum in abdominal fœtation.

Cysts of the corpus luteum are also described, but rarely grow to any considerable size. They are distinguished from ordinary ovarian cysts by some of the yellow substance of the corpus luteum being recognized in their lining. They have not the cylindrical epithelium of the cystic adenoma. The fluid contained is not thick and viscid, but rather thin and serous.

Ovarian tumours generally become pedunculated as they enlarge. The pedicle, which may be long and slender, or short and broad, contains a portion of the broad ligament stretched out, the ligament of the ovary, the ovarian vessels, and the Fallopian tube, which is generally much enlarged, and extended, more or less, over the surface of the tumour. In some cases, however, a cyst, having all the characters of an ovarian cyst, occupies the same position as the so-called "cysts of the broad ligament," having no pedicle, but descending deeply between the folds of the broad ligament. This condition may arise from a follicle having made its way, not to the surface of the ovary, but through the mesovarium into the broad ligament.

Parovarian Cysts, which constitute the most important variety of what have been called cysts of the broad ligament, are formed by distension of one of the tubules of the parovarium, or organ of Rosenmüller, a small body which is the relic of the ducts of the Wolffian body, and is situated in the thickness of the broad ligament, between the outer extremity of the ovary and the Fallopian tube (*see* Fig. 10, p. 15). Their growth is slow, and they often do not increase beyond a small or moderate size, but sometimes they grow large enough to distend the whole abdomen. They are generally found in young women. The contained fluid is limpid, like water, of low specific gravity, generally below 1005, and contains only a trace of albumen, which is usually precipitated only by nitric acid, and not by heat alone. The cysts are almost always unilocular, but rarely may be made up of several, having thin septa, more than one tubule having become dilated. The cysts, in the majority of cases, become pedunculated, but are more likely than true ovarian tumours to descend deeply between the layers of the broad ligament. The ovary is often found distinct, with its mesovarium intact. The Fallopian tube is usually more extended over the cyst than in the case of a true ovarian cyst, and may reach over three-fourths of its semi-circumference. The cyst-wall contains involuntary muscular fibres, which are not usually found in the wall of true ovarian cysts; it is generally separable into two layers, is often lined by ciliated epithelium, and sometimes has papillary growths on its inner wall. Parovarian cysts are sometimes cured by tapping, but this probably means that the aperture made by the trocar remains open, fluid continuously escapes into the peritoneal cavity and is absorbed. There is then risk of malignant affection of the peritoneum, if there is papillary growth in the cysts.

According to Doran, many cysts formerly regarded as parovarian, which contain clear limpid fluid, but are destitute of papillary growths, are not really parovarian, but originate in the broad ligament near the Fallopian tubes. The anatomical relations of these cysts, when they have attained considerable size, are similar to that of parovarian cysts as above described—that is to say, they generally stretch out the broad ligament, so as to form a good pedicle, but are more likely than ovarian cysts to descend deeply between its layers. Fig. 238 is a diagrammatic representation of the various sites at which the different forms of cyst in the ovary and broad ligaments may arise.

Results and Symptoms.—Ovarian cysts, as they grow large, are liable to become adherent to surrounding parts, especially to the omentum and abdominal walls, but sometimes also to the pelvis, intestines, and even the liver and stomach.

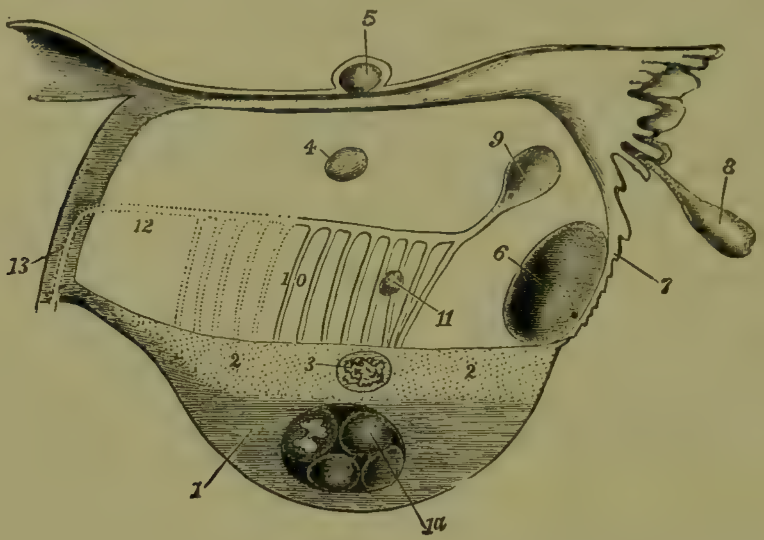

Fig. 238.—Diagram of the Structures in and adjacent to the Broad Ligament (Doran).

1*a*, Multilocular cystic tumour, developed in 1, parenchyma of ovary; 3, papillomatous cystic tumour of ovary in 2, tissue of hilum of ovary; 4, simple broad ligament cyst, independent of parovarium, 10, and Fallopian tube; 5, a similar cyst in broad ligament above tube, but not connected with it; 6, a similar cyst close to 7, ovarian fimbria of tube; 8, hydatid of Morgagni: this appears never to form a large cyst; 9, cyst developed from horizontal tube of parovarium; 11, cyst developed from a vertical tube: cysts of this kind form the papillomatous tumours of the broad ligament; 12, 13, track of obliterated duct of Gartner: papillomatous cysts are said to be developed along this track.

The more solid tumours generally acquire adhesions more readily than those consisting mainly of a few large cysts. Nutrition of ovarian cystomata is apt to fail, especially in the case of multilocular tumours, and the cysts then undergo a partial necrosis, but without putrefaction, so long as air is excluded. The walls of the cysts may become softened, and the fluid within them may contain shreds of broken-down tissue.

More complete death of the tumour results if the pedicle becomes twisted, so as to compress the vessels contained in it. Even after this accident, however, more or less vitality may be maintained through the medium of vascular adhesions. As soon as the nutrition of the tumour is seriously interfered with, its surface becomes inflamed, and contracts adhesions to all surrounding parts. This may be regarded as a sort of effort of Nature to preserve the life of the tumour. Twisting of the pedicle, sufficient to produce strangulation, is said to be more common with cysts of the right ovary, and Mr. Lawson Tait attributed its causation to the alternate filling and emptying of the rectum. Any tangential pressure produced in this way would obviously exercise greater leverage on a tumour attached on the right side. The first effect of twisting of the pedicle is generally hæmorrhage into the cyst.

Inflammation in the tumour may be set up by necrotic changes, or other causes, and then the cysts may suppurate, or lymph be effused within them. As the effect of inflammatory or necrotic changes, general peritonitis is apt to be set up, and the surface of the tumour may then become completely adherent to all the surrounding parts. Without the occurrence of any acute peritonitis, more or less ascitic fluid is often poured out by the peritoneum in consequence of the irritation caused by the presence of the tumour, and occasionally this fluid is copious, though the growth is only of small size. In some cases, the walls of a thin cyst give way from distension, or from the effect of some strain or violence. If the contained fluid is bland, it is absorbed by the peritoneum, and in this way a spontaneous cure sometimes results, if the cyst is small, while, in other cases, the fluid again collects after a time. If the tumour has a tendency towards malignancy, peritoneal metastases may be set up by the escaped fluid.

If the fluid has undergone inflammatory or necrotic change, or is from any cause irritating, as the thicker fluids are apt to be, severe peritonitis is set up, and often proves quickly fatal. In rare cases, after inflammation and suppuration of a cyst, it may discharge either into the intestine (generally the rectum) or externally. Adhesions form in the first place, and perforation afterwards occurs at some adherent spot. Still more rarely discharge takes place into the vagina or bladder. After admission of air, as by tapping, or in consequence of communication with the intestine, septic inflammation of a cyst may be set up, and it may then become distended by fœtid gas.

Hæmorrhage may take place into ovarian cysts, either after strangulation of the vessels by twisting of the pedicle, or spontaneously from the papillary growths. Death may then result from loss of blood, or shock, or inflammation may be set up in the cyst, or in the peritoneum after rupture of the cyst. In rare cases death occurs from intestinal obstruction, ileus being produced either by the effect of adhesions, or from the intestines having simply become twisted in consequence of the pressure. Cure of an ovarian cyst, of any considerable size, by absorption probably never occurs, though tumours diagnosed as ovarian cysts sometimes disappear. But, in those cases, rupture or perforation may have occurred, or the tumour may have been a pseudo-cyst. Suppuration of an ovarian tumour generally occurs through penetration of microbes from adherent intestine, or conveyance of infection by a Fallopian tube, but sometimes the source of the microbes is not obvious. It is especially frequent after delivery, probably in consequence of the traumatic effect upon the tumour. Dermoid cysts are specially liable to suppuration.

In the earlier stages of an ovarian tumour, menstruation is often irregular and painful, and sometimes excessive. In the later stages it is often diminished, and amenorrhœa is common if both ovaries are affected. The general symptoms are often slightly marked, and frequently nothing is noticed except the increase of size. While the cyst is small and remains in the pelvis, trouble in defæcation and micturition may be produced by pressure. These are relieved when it rises into the abdomen, but progressively increased if it happen to become fixed by adhesions while still small. Retention of urine may occur if the cyst is fixed in the pelvis behind the cervix uteri. In other cases more or less pain is felt in the tumour, and attacks of pain may also indicate the occurrence of local adhesive peritonitis set up by its presence, though such a local peritonitis often runs a very latent course. A cyst, even while quite small, may suppurate, become adherent, and discharge through the rectum or elsewhere. A chronic sinus is thus apt to remain.

As the tumour becomes very large, its pressure interferes seriously with vital organs, especially the heart and lungs. There is general wasting, and the face acquires a peculiar expression of combined emaciation and anxiety. The urine becomes scanty from pressure on the renal vessels, and sometimes albuminuria may be produced, although usually not till a very late stage. In some cases, especially when extensive pelvic adhesions exist, there is pressure upon the ureters, and consequent damage to the kidneys. Swelling of the legs is frequently produced by pressure, and the œdema may extend to the abdominal walls and back.

When inflammation or necrotic change has occurred in the tumour, hectic fever of an irritative kind is set up. The occurrence of such fever, in the absence of sufficient pain and tenderness to indicate acute general peritonitis, is an evidence of changes in the tumour, and an indication for early removal. When pregnancy occurs in conjunction with an ovarian tumour, considerable increase of danger arises, if the tumour is large, from the excessive distension, and also from the risk of strangulation by twisting of the pedicle. If the tumour is small it is apt to occupy the pelvis and impede delivery.

Simple cysts are rarely found of very large size, being generally tumours in an early stage. Cystic adenomata may grow to an enormous size. A tumour has been recorded weighing 245 pounds. I have seen in a remote part of Scotland one which must have been larger. The patient had lived many years after refusing operation in Edinburgh; and the woman appeared rather the appendage of the tumour than the tumour of the woman. As she lay in a slanting position, only her feet and ankles just appeared from underneath the tumour.

Papillary cysts rarely grow to a very large size, since they more often lie deeply in the broad ligament, and so cause early symptoms by pressure, while in their progress they are apt to rupture, or to develop malignancy.

In the majority of cases of considerable tumours, not subjected to curative surgical treatment, death occurs within three years, although small or moderate tumours may remain quiescent fo a long period. Exceptionally, even in the case of large tumours, the course may be protracted for many years; and in some instances the operation of tapping has been repeated very many times.

Diagnosis.—When the presence of an abdominal tumour is suspected, the patient should be placed on her back on a hard couch, the head on a low pillow, the skin of the abdomen uncovered, and the knees drawn up so as to relax the abdominal muscles. The examination should be made first by abdominal palpation and percussion, afterwards by bimanual exploration.

Phantom tumours, due to flatulent distension of intestines. deposit of fat in the abdominal walls, omentum, and mesentery, or muscular contraction, are generally easily distinguished by the resonance of the abdomen, and by no tumour being felt between the hands on bimanual examination. In most of these cases, if relaxation of the muscles be obtained by distracting the patient's attention by conversation, or by the administration of an anæsthetic, the hand may be pressed down sufficiently to feel the promontory of the sacrum, and the absence of a tumour ascertained. When there is a great deposit of fat, the percussion note may be partially dull, but not absolutely so. In such cases the layer of subcutaneous fat can be grasped with two hands and lifted; and the umbilicus is depressed. Whether or not any other tumour is discovered, special care should be taken to discover the presence or absence of *pregnancy*, by looking out for all the signs of that condition, particular regard being paid to the consistency of the cervix, the condition of the breasts, and the size of the uterus.

When an ovarian tumour is of great size, and of the multilocular variety, but contains one or more large cysts, diagnosis is generally easy. The outline of the tumour is more or less irregular, both to the eye and the touch, and the irregular prominences are often found to move downward on deep inspiration. There is dulness over the whole tumour, and resonance in the flanks, while the margins of the tumour can often be felt by pressing the hand flat upon the surface. If one hand be laid upon the abdomen, and a gentle flip be given by a finger of the other hand, a fluid thrill can be felt over some part of the tumour, but not throughout its whole extent, while over the area not reached by the thrill, more resistant portions, or solid masses, can often be felt. This vibratile thrill is conclusive of the presence of fluid, while mere fluctuation may sometimes be transmitted by an elastic semi-solid tumour.

When a considerable tumour consists mainly of one large cyst, so that a uniform fluid thrill is felt over the whole of it, and no firmer portion can be detected, the essential point is to distinguish it from *ascites*, and the differentiation is sometimes a difficult one. In most cases the diagnosis may be made from the shape of the abdomen and the results of percussion. In ascites the abdomen spreads out more laterally, while in ovarian cysts it is more prominent in front, and tends to overhang the symphysis pubis. In ascites there is dulness in the flanks in the dorsal position, and resonance in front, while the areas of dulness and resonance alter according to position, so that, in the lateral or upright position, the portions of the abdomen uppermost at the time become resonant, and the dependent parts dull. In a large ovarian cyst there is dulness over the whole centre of the abdomen, and resonance only very far back in the flanks, coming further forward on the side opposite to that on which the tumour originated. When an ovarian cyst, after entry of air, contains gas as well as fluid, there will be resonance in front, but this condition is easily distinguished by the succession splash produced on shaking the patient. Gas is never found in the cyst, unless it has either been tapped, or has discharged spontaneously, as, for instance, into intestine.

Exceptions to the usual rule occur in the case of ascites when the intestines are bound down by adhesions, or the mesentery shortened, so that they cannot reach the surface, and also when the abdominal distension is very extreme, in which case also the abdomen becomes more prominent in front, so that its shape resembles that usual in the case of ovarian tumour. More or less resonance may also be produced by the large intestines fixed in either flank, and then the signs correspond almost exactly to those usual in the case of an ovarian cyst.

Again, in an ovarian cyst, a coil of intestine may be adherent in front, and so give resonance in that position; but as a rule this is only found when inflammation has occurred after tapping. In order to solve the difficulty an attempt should be made to detect the upper margin of a tumour, by laying the hand flat upon the surface at about the upper limit of dulness, and pressing it in during expiration. Trial should also be made, whether on deep inspiration any inequality can be seen or felt moving downward beneath the abdominal wall, or any friction sound heard. When the fluid is within an ovarian cyst, it is generally possible to reach from the vagina the lower segment of the cyst, most frequently in front of the cervix, and feel an impulse transmitted from above. By an ovarian cyst, the uterus is generally drawn somewhat upward, and its mobility more or less impaired, especially toward one side, while in ascites it is low down and movable. In ascites the fluid thrill extends farther round toward the back, over the area in the flanks where partial resonance may exist, while with an ovarian cyst it is limited at the same line as the dulness, unless ascitic fluid is present in addition to the cyst. In some cases the only certain test is a preliminary tapping, or exploratory incision. If there is any reasonable probability that the disease is ovarian, or any form of removable cyst, the latter should be chosen, for the risk of an exploratory incision is but slight, while tapping renders the prognosis of subsequent ovariotomy less favourable.

The difficulty of diagnosis between ascites and ovarian cyst is especially likely to arise in the case of cancer of the peritoneum, in which the intestines are apt to be held back by shortening of the mesentery, and solid masses may be felt in the abdomen, somewhat resembling the firmer portions of an ovarian tumour, but usually more movable in the fluid, and felt only by dipping for them. In peritoneal cancer, hard masses are also often felt behind the cervix on vaginal examination, and may usually be distinguished from the lower portions of an ovarian tumour by their nodular character and fixation to the pelvic wall.

Distinctions between Ovarian and Ascitic and other Fluids.—Since ovarian cysts are hardly ever tapped in the present day, the character of ovarian fluid has become of comparatively little importance for diagnosis. It may still be of value when a large ovarian cyst has been tapped in mistake for ascites, an occurrence which is still not altogether unknown. It is also sometimes important for determining the nature of a doubtful cyst after removal.

The varying physical characters of ovarian fluid have already been mentioned (*see* p. 489). The dark ropy fluid of high specific gravity (1025 upwards) is found only in ovarian cysts. Ascitic fluid is limpid and yellowish, containing a considerable quantity of albumen, and having usually a specific gravity of from 1010 to 1015—characters which distinguish it from most ovarian fluid. It may also be generally recognized by its property of depositing fibrin spontaneously in a very delicate layer upon the surface of the glass, though fibrin is occasionally found also in ovarian fluid, after inflammation of the cyst. Ovarian fluid which physically resembles ascitic fluid may be distinguished by the chemical character that it contains paralbumen,* lately called pseudomucin, as well as albumen, while, in the more viscid kinds of ovarian fluid, mucin (*see* p. 489) may also be detected.

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* Add nitric acid to form a precipitate; shake up the fluid, and then boil it with about an equal quantity of acetic acid. Boil another portion similarly with a like quantity of water, for the sake of comparison. If the precipitate by nitric acid is partially dissolved, or gelatinized, by the acetic acid, the presence of paralbumen is shown.

Ovarian fluid may also generally be recognized by its microscopical characters. It usually contains epithelial cells of various forms, cholesterine, leucocytes, and often large granule masses. But of special importance are cylindrical epithelium and the granular ovarian cell (Fig. 239 *a*), described by Dr. Drysdale, of Philadelphia, as being pathognomonic of ovarian fluid. This contains a number of fine granules, but no nucleus, and is regarded as being a degenerated epithelial cell. Its size varies from $\frac{1}{5000}$ to $\frac{1}{2000}$ inch, but the size commonly met with is about that of a leucocyte. From a leucocyte, however, it is distinguished, according to Dr. Drysdale, by the addition of acetic acid. This renders the leucocyte very transparent (Fig. 239, *c*), and nuclei, varying in number from one to four, become visible, while the ovarian cell is simply rendered rather more transparent, and its granules more distinct. From the larger granule masses it is distinguished by being unaltered on the addition of ether. Similar cells have, however, been reported in other fluids not ovarian, and less importance than formerly is attached to this test. Ascitic fluid under the microscope generally shows only cells of the peritoneal endothelium, leucocytes, and fibrin. For the characters of the fluid of a fibrocystic tumour, *see* p. 379; for those of parovarian fluid, *see* p. 493 If the fluid is found purulent, when no previous tapping has taken place, it is more likely to come from a dermoid cyst.

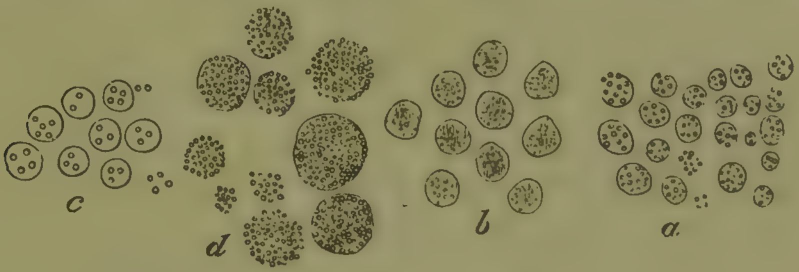

Fig. 239.—Microscopic Characters of Ovarian Fluids.
a, granular ovarian cell of Drysdale; *b*, leucocyte before addition of acetic acid; *c*, leucocyte after addition of acetic acid; *d*, compound granular cell or inflammatory corpuscle of Gluge.

If the existence of a large cyst is established, it is necessary to distinguish between an ovarian tumour and several other conditions which have sometimes been mistaken for it.

Pregnancy with hydrops amnii is usually distinguished from ovarian tumour alone by the condition of the cervix, but has not unfrequently been mistaken for an ovarian cyst associated with pregnancy, and sometimes even the uterus has been punctured owing to a mistake in diagnosis. It may be possible to make out the body of the uterus as distinct from the cyst on bimanual examination; but this may fail if distension is extreme. The varying consistency of the tumour of hydrops amnii, from alternate contraction and relaxation of the uterus, is distinctive, if observed, and generally affords the best means of diagnosis, if signs of fœtal life cannot be discovered in the abdominal tumour. The cervix uteri in hydrops amnii is generally more pervious to the finger than in the earlier months of normal pregnancy, and its condition may be an important aid in diagnosis. It should also be ascertained whether the lower segment of the uterus, felt through the anterior vaginal wall, has the characters usual in normal pregnancy.

A *fibro-cystic tumour* of the uterus is generally of slower growth than an ovarian tumour. It will usually be distinguished by a history of symptoms such as menorrhagia, pointing to a uterine fibroid, and by lengthening of the uterine cavity. It is rare for the whole of the tumour to be cystic.

Sub-peritoneal uterine fibroids cannot always be distinguished with certainty from solid or very polycystic ovarian tumours. If a sub-peritoneal fibroid has been converted into a single cyst, it may still more closely resemble an ovarian cyst. A *soft œdematous fibroid tumour* of the uterus may be fluctuating enough to resemble a cyst, but does not give so distinct a fluid thrill. The diagnosis is similar to that of a fibro-cystic tumour. If an abdominal section is made, the thicker, fleshy, red wall of a uterine tumour distinguishes it, in contrast with the thinner, generally bluish wall of an ovarian cyst. But in some cases the broad ligament may be drawn up in front of an ovarian cyst, and resemble in appearance the wall of a uterine tumour.

Cysts of the omentum or mesentery and *cysts of the pancreas* are generally connected with the upper part of the abdomen rather than the pelvis, but cannot always be distinguished from an ovarian cyst till the abdomen is opened.

A *distended bladder* is distinguished by the use of the catheter, which should always be employed if an apparently central and unilocular cyst of moderate size be discovered.

Hydronephrosis and *pyonephrosis*, as well as solid tumours of the kidney, generally malignant, have led to mistakes. The tumour formed by any of these commences from the region of the kidney, usually pushes the colon in front of it, and rarely completely fills the abdomen towards the opposite groin, or comes into close relation to the uterus. Colon resonance cannot, however, always be obtained in front of a renal tumour. Renal tumours, and all other tumours originating in the upper part of the abdomen, generally descend with the diaphragm on deep inspiration, while an ovarian tumour does not. The fluid of hydronephrosis may sometimes, but not always, be recognized by the presence in it of urea or creatin. In renal tumours a history of disturbance in the urinary system, or the presence of albumen, pus, or blood in the urine, may sometimes guide to a diagnosis. In hydronephrosis the contents of the cyst do not usually escape through the bladder.

Hydatid tumours would more often lead to error, but for the fact that they very rarely occur in the pelvis, and generally commence from the region of the liver or the upper part of the abdomen. When a hydatid cyst does occur in the pelvis, as, for instance, in the ante-uterine or retro-uterine fossa of the peritoneum, as is sometimes the case, there may be a similar cyst in the liver, or elsewhere in the abdomen. If not, the nature of the tumour is likely only to be discovered on abdominal section.

The best test is an exploratory incision, or—if a specimen of fluid is obtained for examination by the hypodermic needle, or tapping is performed—the microscopical examination of the fluid, which, from its physical character, may be mistaken for that of a parovarian cyst. I have met with one case in which the cyst had none of the tenseness usual in hydatid tumours, and no sign of hydatids was discovered on microscopical examination of the fluid. The cyst afterwards suppurated, and was eventually removed. It was still thought to be parovarian, until, at the autopsy, its association with smaller hydatid cysts was discovered. In a case under my own care, the cyst, having become inflamed, closely simulated a large ovarian tumour, and a thick brownish fluid was evacuated by tapping. Decomposition then occurred, and hydatids escaped when the cyst was laid open. The patient recovered after insertion of a large drainage-tube, and frequent injections with a weak solution of iodine. Multiple hydatid cysts of the omentum may also closely resemble a multilocular ovarian tumour.

Encysted serous or purulent fluid may closely resemble an ovarian cyst. Such a collection may attain to considerable size, especially when due to cancer or tuberculosis of the peritoneum. Sometimes large encysted collections of pus are formed in a late stage of septic peritonitis. I have met with one case in which a large pus-containing cyst behind the uterus, and reaching as high as the umbilicus, was secondary to cancer high up in the rectum. The resemblance will generally be to an ovarian cyst associated with peritonitis, and fixed by adhesion. If the pseudo-cyst is irregular in shape, sending prolongations among the intestines, it may often be distinguished by the fact that the fluid thrill extends beyond the area of dulness; but, in general, the diagnosis must be made in great measure by the history and course of the affection. There will generally be a history of illness, with pain and inflammation, preceding by some considerable time the appearance of a tumour. But it must be remembered that an ovarian cyst may be overlooked until it has become inflamed from twisting of the pedicle or other reason; and I have known such cysts to be overlooked even after inflammation had occurred. If, therefore, the physical signs appear to be clear, more importance should be attached to them than to the history.

When the effusion is serous, and due to simple peritonitis (the "serous perimetritis" of Dr. Matthews Duncan), it may be distinguished by its sudden appearance in connection with acute inflammatory symptoms, and by its gradual diminution and disappearance. If the fluid be drawn off, it will generally be found to contain flakes of lymph, and will spontaneously deposit a coagulum of fibrin. A serous perimetritis may acquire a kind of false cyst-wall formed of plastic lymph, and thus counterfeit a true cyst, even after the abdomen has been opened.

Retro-peritoneal cysts have occasionally been found, and are to be distinguished by their place of origin, and want of connection with the uterus. If such a cyst is of large size, and descends into the pelvis, it may be impossible to distinguish it from an ovarian cyst, until an operation is undertaken. A cyst of small or moderate size may be a distended Fallopian tube. The differential diagnosis, which is not always possible, is described under the head of Diseases of the Fallopian Tubes.

Advanced extra-uterine fœtation will be recognized by a history of pregnancy not ending in delivery. The hard parts of the fœtus will be felt in the midst of the fluctuating cyst, or the fluid will have been absorbed, and the whole tumour be firm and irregular.

When a considerable tumour exists, but no manifest fluid thrill can be felt over any large part of it, and even in some cases in which there is manifest evidence of a large cyst, the point requiring most care is the diagnosis whether the tumour is *uterine or ovarian.* For this a careful exploration, by the sound, of the position of the uterus and its mobility, with an exploration of the mode of attachment of the tumour to the uterus, is necessary. The method of diagnosis has already been described (*see* p. 377).

Cancer springing from the omentum or elsewhere in the abdomen, or even medullary cancer of the kidney, may form a large tumour, sometimes reaching into the lower part of the abdomen, and forming deposits in the pelvis. Such a tumour is not fluid, though it may be soft and semi-fluctuating, and is often associated with ascites. Some portion of it is generally fixed by adhesion. If the ascitic fluid be examined, it may indicate the presence of blood, obviously or by spectroscope, or show clusters of detached cells. The age of the patient, and the amount of emaciation and cachexia present, will greatly aid the diagnosis.

Leukæmic enlargement of the spleen may form a tumour, which becomes displaced into the lower part of the abdomen, but is generally easily recognized by its sharp hard border, broken by a depression, and usually looking upward, or upward and towards the right, the convex surface of the spleen having rotated downward. The distinctive edge, however, may be obscured to a great extent, or even entirely, if the growth in the central part of the spleen has assumed a spherical form. In rare cases the spleen may descend so low in the pelvis as to be felt from the vagina behind the uterus. In case of doubt the blood should be examined for excess of white corpuscles. The absence of excess does not, however, show that the tumour is not splenic; for the case may be one of the so-called pseudo-leukæmia. In such cases there is generally some obvious anæmia.

Fæcal accumulations are distinguished by their position, unconnected with the uterus, by their doughy feel, and by the effect of purgatives and enemata.

Diagnosis in the Early Stage.—In the early stage ot an ovarian tumour, while it is smaller than a fœtal head, the method of diagnosis is somewhat different. If the tumour is free from adhesion, the diagnosis is usually easy. A well-defined, globular, and elastic tumour is felt, on bimanual examination, behind, in front, or at one side of the uterus, movable to some extent, but tethered to that organ by the ovarian ligament, which can often be distinguished. A *parovarian cyst*, or *hydrosalpinx*, may be confounded with an ovarian cyst, and cannot always be distinguished except by exploratory operation or examination of the contained fluid. A parovarian cyst will generally lie lower in the broad ligament, and a hydrosalpinx will have a retort shape. *Pyosalpinx* is also difficult to distinguish, but is accompanied by signs of local peritonitis. It has usually a convoluted or retort shape; and both hydrosalpinx and pyosalpinx are often bilateral, or, at any rate, accompanied by thickening on the other side.

A *sub-peritoneal fibroid of the uterus* is generally known by its hardness, and by its mode of attachment to the uterus, especially if the examination be made by finger in the rectum, the patient being placed under an anæsthetic, and the cervix drawn down by tenaculum (*see* pp. 39, 40). If a small ovarian tumour is surrounded by adhesions, especially when it lies behind the uterus, it may be very difficult to distinguish it from *hæmatocele*, or a swelling due to pelvic peritonitis. The best guide is the history and course of the affection. With *pelvic cellulitis* an ovarian tumour is less likely to be confounded.

In *extra-uterine fœtation in the early months* there will usually be a history of amenorrhœa for a time, with general signs of pregnancy, although sometimes there is no interruption of menstruation. In any of the forms of tubal pregnancy, the amenorrhœa, if any occurs, is apt to be followed by irregular hæmorrhage and violent spasmodic pain, while pain sometimes exists from the very first. The uterus will be notably enlarged; and strong arterial pulsation will be felt near the cyst, which usually occupies the retro-uterine fossa. Sometimes ballottement in the cyst, or signs of fœtal life may be detected, or the diagnosis may be decided by the expulsion of a decidua from the uterus. After the death of the fœtus, the tumour tends to diminish in size, and to become harder. *Small hydatid cysts* in the pelvis are very rare in Britain, and can scarcely be diagnosed, except by examination of the fluid.

Diagnosis of Adhesions.—The general mobility of a tumour of moderate size may be tested by grasping it with both hands through the abdominal wall, and moving it from side to side. In the absence of adhesions in front, if distension is not very great, the abdominal walls can be freely moved over the tumour, and also lifted up, to some extent, from its surface. Frequently parts of the tumour may be observed to glide downwards under the surface on deep inspiration. All these signs are more easily detected in multilocular tumours, or those containing solid matter, than in those which are nearly unilocular. Measurements should be made of the distance of the umbilicus from the anterior superior spines of the ilia, and from the edges of the ribs on each side. Any marked inequality in these distances, not accounted for by the shape of the tumour, renders the existence of adhesions in front probable. A friction sound on respiration indicates the absence of any firm adhesion over the area where it is heard, and is generally due to roughening of the peritoneum from an early stage or slight degree of peritonitis.

If a portion of the tumour descends into the pelvis behind the cervix or elsewhere, and cannot be pushed up, it may either be adherent or simply fixed by pressure. The degree of fixation is estimated by observing whether the mass yields at all to pressure from the vagina or rectum. If the whole pelvic roof is indurated, and the uterus fixed, and the utero-sacral ligaments, as felt *per rectum*, infiltrated with inflammatory thickening, firm adhesions in the pelvis are indicated. If the uterus cannot be moved by means of the sound separately from the tumour, it may be inferred that the tumour, if ovarian, is closely connected with the uterus ; and this presumption is increased if the uterus be much drawn upward, and its cavity elongated. In estimating the attachment of the tumour to the uterus, rectal exploration should be used, and it is often of advantage to put the attachments on the stretch by drawing down the cervix (*see* p. 40). The probability of intestinal and other adhesions posteriorly can only be inferred from a history of peritonitis. Omental adhesions cannot be diagnosed, but are of little consequence.

Diagnosis of Malignancy.—The greater the proportion of solid material in a tumour, the greater is its tendency towards malignancy likely to be. The age of the patient is a useful guide, and valuable evidence is afforded by a cachexia and emaciation out of proportion to the size and duration of the tumour. A very large amount of ascitic fluid in combination with a comparatively small and firm tumour, renders probable at least some approximation towards malignancy. If signs of pelvic adhesion are found, with much solid matter at the base of the tumour, and nodular masses like glands behind or around the cervix, or embedded in the utero-sacral ligaments, and if much cachexia is also present, the evidence of malignancy is very strong.

If grape-like clusters of cells, of very varying shape, many of which have multiple nuclei, are found in fluid withdrawn from a cyst, they indicate that proliferating papillary growths are present, and that the tumour should be immediately extirpated, if possible. If similar groups of cells are found in ascitic fluid, they indicate that cancer or papilloma has reached the peritoneum from the ovary, or from some other source, and that ovariotomy will probably be too late to prevent recurrence. Patients have, however, recovered, and remained free from disease for years, even when extension of papillary growths to the peritoneum has been found at an operation, especially if the papilloma has started from the Fallopian tubes. A similar indication of probable malignancy is given if blood is detected, either obviously or by spectroscopic or other evidence, in ascitic fluid.

Treatment.—The great success of ovariotomy has reduced the treatment of ovarian tumours, in the large majority of cases, to ovariotomy as a curative, and tapping as a palliative measure in the rare cases in which removal of the tumour is impossible.

Indications for Ovariotomy.—It was formerly considered preferable not to operate until the tumour had attained some considerable size, and had begun seriously to inconvenience or disable the patient, or to tell upon her general health. But in the hands of skilled specialists a simple case of ovariotomy, with a tumour of small or moderate size, now involves an inappreciable risk. At any stage in its course an ovarian tumour may have its pedicle twisted, or may undergo necrotic change and set up inflammation. The safest plan for the patient, therefore, is to remove the tumour as soon as it is positively diagnosed. In any case the operation should be performed before there is sufficient distension to embarrass the lungs, heart, or kidneys, or produce œdema of legs and abdomen. If symptoms of inflammation or partial necrosis of the cyst supervene, its removal should not be delayed. Sometimes the occurrence of hæmorrhage into a cyst, or the commencement of inflammation or necrosis in it, due to twisting of the pedicle, is indicated by the onset of severe pain in the tumour, or pain followed by vomiting and, generally, the symptoms of peritonitis around the tumour. Ovariotomy should then be performed immediately. If acute peritonitis occurs it may be desirable to wait awhile, until the symptoms have subsided; but ovariotomy, if practicable at all, should generally be performed within a few weeks, before the adhesions have become so firm as to render their separation very difficult. If there is an indication by any of the signs previously enumerated (p. 507) that the tumour is of a kind tending towards malignancy, the reasons for early removal are the stronger.

The chief *contra-indications* are signs of malignancy in the tumour, accompanied by extension of the growth to surrounding parts. Evidence even of very firm pelvic adhesions, accompanied by solidity in the lower part of the tumour, is scarcely now considered as a contra-indication, unless the patient is so nearly moribund as to be unable to survive a difficult operation. Coils of intestine are sometimes recognized as adherent in front of the cyst, especially when a previous tapping has been followed by peritonitis; and this condition would indicate the probability of extensive visceral adhesion in other parts also; but this would not necessarily deter a practised operator from performing ovariotomy. Elongation of the uterus, and its close connection with the tumour, render it likely that the operation will be difficult, but do not contra-indicate it. Adhesions to the abdominal wall are of comparatively little moment. In doubtful cases the age and general condition of the patient, and the state of the kidneys and other viscera, are elements in the decision.

The complication of an ovarian tumour with pregnancy often proves a serious one; since the growth of the tumour is apt to be stimulated, distension may become so great as to necessite some interference, and, moreover, the pressure of the growing uterus occasionally produces twisting and strangulation of the pedicle. Ovariotomy during pregnancy has proved remarkably successful, and abortion is by no means a necessary sequel of the operation. If the case is otherwise suitable for ovariotomy, that operation may be performed, at any rate in the earlier months. I have once successfully removed an ovarian tumour about the middle of the sixth month without miscarriage following, but in most recorded cases which had passed beyond the fifth month, miscarriage has followed sooner or later; and this adds to the risk, if it happens shortly after the operation. In the case of adhesions near the uterus, bleeding is likely to be formidable in the later months, and if the case has advanced much beyond the fifth month the alternative course has to be considered, supposing interference to be necessary, and ovariotomy likely to be difficult, of inducing labour first, and removing the tumour some weeks later.

The Operation of Ovariotomy.—The general management of abdominal sections has been described in Chapter III. The Trendelenberg position is not generally required. But, if unexpected difficulties arise, such as a deep descent of the cyst into the broad ligament, requiring stitching low down in the pelvis, it is a great advantage to have the means of obtaining it.

The incision is to be made in the linea alba. It should be at first of moderate length, not exceeding four inches, nor passing above the umbilicus. It may afterwards be extended upwards, if required. Sir Spencer Wells found the mortality to be notably less when the tumour could be extracted through an incision not exceeding these dimensions. It is preferable, however, to extend the incision rather than to separate out of sight adhesions to omentum or intestines, which are likely to cause subsequent hæmorrhage. When the peritoneal cavity has once been opened, two fingers may be introduced as a director, and the incision through the peritoneum prolonged upward and downward. There is thus less risk of injuring the bladder than if a director were used. The cyst is generally recognized by its bluish appearance, but when it is firmly adherent to the abdominal wall, difficulty may be found in ascertaining when the peritoneum has been divided, and the operator may peel off the parietal peritoneum, mistaking it for the cyst-wall. In case of great doubt the best method to follow is to ascertain whether the supposed cyst-wall can be peeled off at the situation of the umbilicus. This will be impossible if it is really parietal peritoneum.

It is better to cut into the cyst, and let the fluid escape. than to run any risk of separating peritoneum in mistake for cyst-wall. After the cyst has been emptied, the line of demarcation can be sought for, and the separation made.

After the tumour is exposed, the fingers may be introduced between it and the abdominal walls, and swept round on all sides, to separate any adhesions existing in front. If, however, the adhesions be found very firm, and especially if the cyst-wall be thin or friable, it is better first to empty the tumour. Before it is tapped, sterilized pads should be tucked under the abdominal wall, around the site of intended puncture, to prevent any fluid getting into the peritoneal cavity.

In ordinary cases a simple curved trocar and canula of fair length (Fig. 241, p. 512) may be used for the tapping. The calibre should not be too small, not less than 6—8-mm. diameter, otherwise the emptying of the cyst will take too long. The fluid, as it runs, is caught in basins or dishes, so that the towels covering the abdomen are not soiled. The flow may be hastened by pressure at the sides of the abdomen.

As soon as the cyst begins to get lax its wall is seized near the point of puncture by one or two pressure forceps or vulsella, and gradually drawn out through the opening as the cyst is emptied. If the emptying of the cyst first punctured does not sufficiently reduce the tumour, the trocar is again inserted in the canula, and used to tap other cysts, guided by the hand, passed between the tumour and the abdominal wall, until the tumour can be drawn out through the incision.

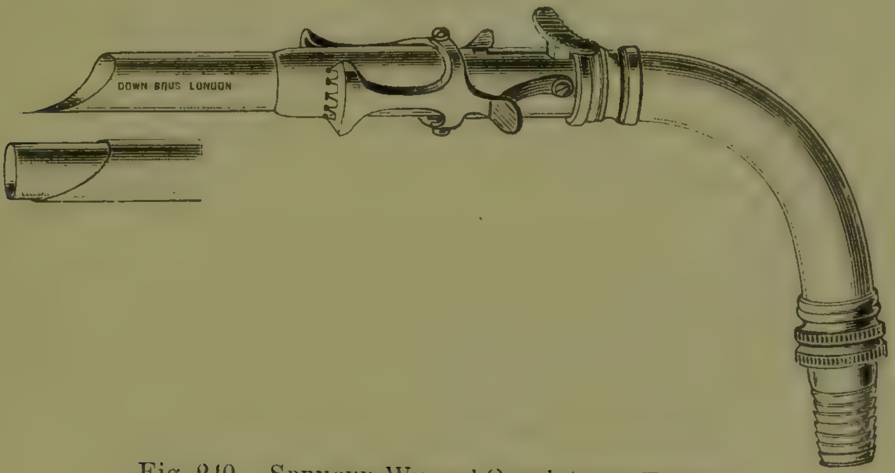

Fig. 240.—Spencer Wells' Ovariotomy Trocar.

The ovariotomy trocar introduced by Sir Spencer Wells is shown in Fig. 240. Its large calibre allows very thick fluid and flakes to pass which would not go through the small canula ; but it is rather more apt to tear a thin-walled or necrotic cyst than the small sharp trocar, and so allow fluid to escape by the side of the tube. After puncture of the cyst the inner tube is pushed forward to guard the end of the trocar, but can be withdrawn again when it is desired to tap secondary cysts. It is well to have this instrument at hand, in case the fluid should refuse to flow through the smaller trocar. If the cyst proves to be filled with the thick colloid material like jelly, which refuses to pass through any canula, an opening in the cyst should be made large enough to admit the hand, and the jelly extracted in handfuls.

Spencer Wells' trocar is provided with claws which seize the cyst-wall, so that no other vulsella are required, and the cyst is drawn out by their means. If, when the part of the cyst-wall that has been punctured is drawn well outside the abdominal wound, other secondary cysts still remain, large enough to prevent the withdrawal of the whole tumour, it is best to remove the trocar, enlarge the opening, and fix at each side of it a pair of cyst-forceps (Fig. 242) to hold it forward. The fingers are then introduced through the opening, and the secondary cysts broken up, or the trocar guided to tap them. Two fingers of the other hand, passed on the outside of the tumour, ascertain the position of the secondary cysts, and make sure that the outer wall of the tumour is not broken through.

If much solid material exists, or adenomatous tissue, consisting of a multitude of minute cysts, the abdominal incision should be extended sufficiently to allow the tumour to be extracted without much manipulation. This is especially necessary if those very thin cyst-walls are found which are often associated with a tendency to malignancy.

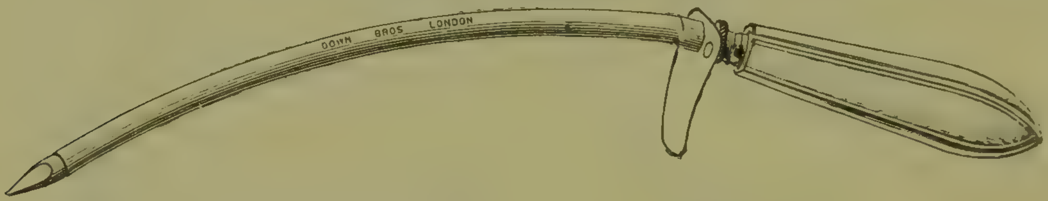

Fig. 241.—Curved Trocar and Canula.

As the tumour is withdrawn, omental adhesions often come into view. Special care is required to guard against subsequent hæmorrhage in the case of these adhesions; and, if there is a broad surface adherent, it is a good plan to divide it into sections, and tie each separately, before dividing the omentum with scissors. Other strong bands of adhesion may be tied before division in a similar manner. For small vessels or adhesions, silk, Chinese twist No. 1, may be used; for omentum or thicker bands of adhesion, No. 2 or No. 3. Adhesions to intestine, stomach, or liver require special caution in their separation, which should be effected, if possible, by gentle traction, or by the finger-nail, or handle of the knife. If, however, a portion of cyst-wall be very firmly adherent, it is preferable to cut the rest of the tumour away from it, and leave it attached, having first enucleated from it the inner secreting membrane. Firm adhesions within the pelvis are likely to lead to the greatest difficulties. If they cannot be separated by the fingers, the plan of enucleation should be tried. A transverse incision is made through the outer wall of the cyst, a little above the adherent surface; the fingers are introduced through the opening, and the cyst-wall split into two layers, of which the outer is left attached. Any vessels in it which bleed are secured individually. After removal of the tumour, minute care must be taken to arrest all hæmorrhage. Oozing from even a considerable vascular surface, such as that produced by detachment of an adhesion to the uterus, may be stopped by successively seizing the bleeding points by tenaculum forceps and tying them with fine silk. In extreme cases the galvanic, benzoline, or actual cautery have been used, but are very rarely necessary. If the bleeding points are situated on uterus or abdominal or pelvic wall, and are difficult to seize, they may be secured by a figure-of-eight suture of fine silk passed under them with a curved needle.

If bleeding is considerable from separated pelvic adhesions, the pelvis may be temporarily plugged by several sterilized pads pressed down into it, and left in place while the pedicle is being secured. If, after removal of the plugs, bleeding continues, the bleeding points must be sought for and tied separately. If the tumour has been a large one there may be no difficulty in getting a view of the bottom of the pelvis in the ordinary position. If it has been comparatively small, and intestines interfere, great assistance may be obtained from the Trendelenberg position, the intestines being held back by a large pad. If necessary the abdominal incision must be extended.

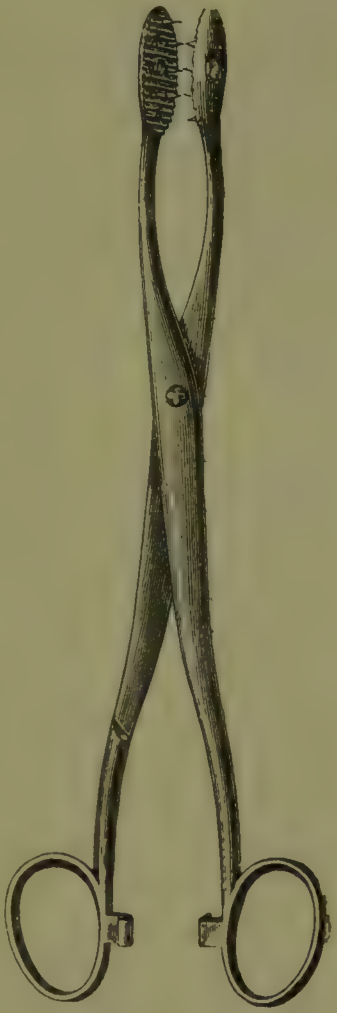

Fig. 242.
Nelaton's Cyst Forceps.

In the *treatment of the pedicle* it is not sufficient simply to tie it in two halves, unless it is a very narrow one, such as sometimes results from the effect of torsion. It is safest to place first a separate ligature on the ovarian artery, and then to tie the rest of the pedicle in sections. Chinese twist No. 4

should be used. By the following method a double loop may be made to tie in sections even the broadest pedicle. A sharp-pointed pedicle needle (Fig. 199, p. 396) is used.

The needle is first passed through the ovarian ligament if that is visible, or, if not, near the inner border of the pedicle. It is then passed again through the central part of the pedicle once, twice, or thrice, according to its width. Finally, it again transfixes the pedicle close to its outer border near the ovarian vessels, passing just on the distal side of the ligature which has already secured the ovarian artery. Care is taken to avoid puncturing any large veins which may be visible. The pedicle is then tied in two sections, the first hitch of each knot being a double one. If the pedicle is at all bulky, the whole of it should afterwards be encircled by one of the ligatures, and the ends are then cut short.

When the ligatures have been tied, the pedicle is seized just above them by a pair of catch forceps at each side, while the tumour is cut away about half an inch from the ligatures. The pedicle is then kept under control till it is certain that no bleeding takes place from it.

If the cyst is found to descend between the layers of the broad ligament, below the level of the fundus uteri, it is difficult or impossible to make any pedicle, especially if it burrows under the sigmoid flexure or cæcum. The cyst wall, however, can generally be enucleated out of the covering of the broad ligament toward its lower part. A plan formerly often adopted was, after ligature of the ovarian artery, to turn as much as possible of the cyst out of the abdomen, cut off the redundant portion of it at the level of the abdominal wall, securing any bleeding vessels, then to enucleate the base of the cyst from its outer covering, and stitch this outer layer to the lower part of the abdominal incision, closing the rest of wound in the usual way. This involved a slow convalescence and the leaving a weak place in the abdominal wall.

It is now generally found practicable to stitch up the gap in the broad ligament after bleeding from it has been arrested. First, the ovarian artery is tied. From half an inch above the ligature the peritoneum is divided in a horizontal line toward the uterus both at the front and at the back of the cyst. The cyst is then enucleated out of the broad ligament from without inward. The communicating branch of the uterine artery will require ligature, and any other vessels that bleed.

For closing up the broad ligament it will be advisable to place the patient in the Trendelenberg position and keep the intestines back with a large pad. If the gap is only moderate it will be sufficient to stitch the peritoneum with a continuous suture of silk Chinese twist No. 2 in the way described for the case of hysterectomy (*see* p. 399). The needle pierces the anterior peritoneum twice and the posterior peritoneum once, so as to effect a sero-fibrous union. If the gap is larger one or two tiers of buried suture may be placed lower down to close it. If this cannot be effected, as, for instance, when the cyst has burrowed very deeply under the sigmoid flexure, and when there is considerable oozing from the separated surface, a hæmatoma may be formed if the peritoneum is closed over the gap. This may possibly suppurate, and perhaps infect the general peritoneum. Under these circumstances it may be advisable to make an opening from the cavity into the posterior fornix of the vagina on the inside of the ureter, and drain by a strip of moist iodoform gauze, 10 per cent.

After complete removal of the cyst, all surfaces where adhesions have been separated, especially any separated omentum, should be examined for bleeding vessels, and any such vessels tied. The ovary of the opposite side should be examined, since ovarian tumours are sometimes bilateral. If an incipient cyst is found in it, it may sometimes be necessary to remove the second ovary, especially if the original tumour was a papillary cyst or showed signs suspicious of malignancy. Sometimes it is possible to resect the cyst and stitch up the gap so as to preserve a functional ovary. A continuous suture of gossamer silkworm gut answers well for the purpose. I have even, in the case of a small cyst, with the ovarian tissue spread out over its surface, turned the cyst inside out, enucleated the lining, and stitched up the aperture, leaving the cyst to form a hæmatoma, with a satisfactory result.

The toilette of the peritoneum, and closure and dressing of the abdominal wound, have been described in Chapter III.

If a considerable quantity of ovarian fluid has got into the peritoneal cavity, from rupture of a cyst before or during the operation, the abdomen should be washed out with sterilized normal saline solution, gr. lx ad Oj. Otherwise, it is better only to mop out with sterilized pads, unless it is desired, on account of severe hæmorrhage or collapse of the patient, to leave some saline solution in the peritoneal cavity.

Some years ago it was usual to drain by means of a Keith's drainage tube all cases in which extensive adhesions had been separated, and there was likely to be considerable sanguineous oozing. Drainage is now very rarely used on account of hæmorrhage from adhesions only, but is reserved for cases in which septic fluid, likely to be of a virulent kind, has escaped into the abdominal cavity, or in which an intra-peritoneal abscess cavity has been opened. For the methods of drainage, *see* pages 87—92. Keith's drainage tube of glass is the most easily and quickly applied, but a drain of iodoform gauze from the pouch of Douglas through the vagina appears to be generally preferable, when it is practicable.

If drainage is not used the dressings may generally be left undisturbed until the eighth or ninth day, when the sutures are removed. If, however, there is much fat in the abdominal walls, it is preferable to leave the sutures in for ten days. There is this advantage in having some superficial sutures that, since they have no tension upon them, these may be left in several days after the deep sutures are removed, and prevent any separation at the surface. If a drainage tube has been used, the sutures next to it should be kept in until several days after its removal.

Towards the end of the first twenty-four hours a little milk or barley-water may be given; but, if vomiting is troublesome, recourse should be had early to nutrient enemata, and the stomach left at rest. Morphia or opium is to be given by the rectum or subcutaneously in sufficient amount to keep pain in check after the operation. As a rule it is not required, except to secure sleep at night, and the less given the better. In case of considerable elevation of temperature—a condition generally due to peritonitis of septic origin—advantage has often been found from the use of Thornton's ice-water cap, whereby a current of cold water is kept constantly circulating round the head. Leiter's temperature regulator, in which tubing of soft metal is arranged in the form of a cap, may be used in the same way. In case of abdominal distension, with rise of temperature, symptoms which appear to threaten peritonitis, Lawson Tait's treatment appears to be often beneficial, namely, to give turpentine enemata, and saline laxatives, such as a seidlitz powder, until the bowels act, or even a dose of calomel.

The Operation of Paracentesis.—The same antiseptic precautions should be used for paracentesis as for abdomina section. The instrument used should be about ¼-in. in diameter, and may be either an ordinary trocar and canula, or Sir Spencer Wells' syphon canula, which has a bevelled extremity, and a cutting edge for half its circumference, so that it cuts a valvular opening. The latter instrument diminishes the risk of any fluid escaping into the peritoneal cavity during the momentary interval between the puncture and the withdrawal of the trocar.

For the operation the patient should be placed on her side, with her head rather low, to avoid the occurrence of faintness from sudden diminution of abdominal pressure. One or more pails must be provided to receive the fluid. A small incision should be made with a scalpel just through the skin, before the trocar is inserted. A long india-rubber tube should be previously attached, either to the syphon canula or to a short tube which is fitted into the ordinary canula at the moment when the trocar is withdrawn. In this way the entry of air is rendered less probable, and the syphon action assists the evacuation of the fluid. If a large amount of ascitic fluid is present, in addition to a tumour, it is better to make a small incision through the abdominal wall with a scalpel, until the peritoneum is just divided, and then to pass in through the opening a large gum-elastic catheter, which should be a new instrument and carefully sterilized. In this way there is no risk of wounding the tumour or intestines; the ascitic fluid is drawn off first, the outline of the tumour can then be exactly explored, and it also can be afterwards tapped, if necessary.

Paracentesis generally leads to the formation of adhesions near the puncture, and often over a considerable surface. Hence it should never be performed as a preliminary to ovariotomy, unless distension is so great as to require immediate relief before ovariotomy can be arranged; and then ovariotomy should not be long delayed afterwards.

Other Modes of Treatment, in the present day, are to be thought of only when ovariotomy is judged impracticable, or when, after exploratory incision, it is found that the tumour cannot be removed. In the case of a unilocular cyst, or one containing no secondary growths in its lower part, if it is found, after incision, that the cyst is inseparably adherent in all directions, the opening in the cyst may be sewn to the edges of the abdominal wound, and the cyst treated by drainage. If the upper part of the cyst can be removed, its lower part may be sewn to the abdominal walls in a similar way, the lining having been enucleated if possible. The more experienced the operator, the fewer will be the cases in which he is compelled to leave the operation incomplete. If there are secondary growths in the lower part of the tumour, nothing short of complete removal is of any use. If the tumour is found to be malignant and irremovable, any fluid in the peritoneum only should be evacuated and the abdomen closed as quickly as possible.

DERMOID CYSTS OF THE OVARY.

Pathological Anatomy.—The term dermoid cyst, though not a strictly appropriate one, has been applied to cysts of the ovary whose inner surface is a structure resembling skin, generally containing sebaceous and sometimes sweat glands, and often provided with numerous hairs growing in hair-follicles. In the cellular tissue beneath, true bones are often found, frequently having teeth, and sometimes more or less resembling some definite bones of a fœtus. Teeth may also be found separately in the tissue, or be cast off into the cyst, within which a large number of them may be accumulated. They are sometimes well formed, having more or less resemblance to some special form of normal tooth, but more frequently rudimentary. Generally, when the crown is simple the root is long; when it is multicuspidate the root is short. Teeth with more than one root are very rare. In rare cases, striated muscular fibre or grey nerve-substance has been found in the cyst wall. The cyst is generally single, or appears to be divided into compartments by the growth of septa from its walls. The contents of the cyst are generally a thick gruel-like material, made up of sebaceous secretion and cast-off epithelial cells, with the addition frequently of cast-off hairs, sometimes to a considerable amount. Cholesterine may also be present in large quantity. When the contents have been evacuated, the fat generally solidifies like butter on cooling. In some cases the cysts have been found filled, not with fluid fat, but with little round pellets of solid fat, often containing short hairs in the centre. This depends upon the fat being for some reason so constituted that it is just solid at the temperature of the body. It then becomes moulded into the pellets by the effect of movement. The pellets have been called epithelial pearls.

The attached hair may grow to a considerable length, and, entangled in the fat, may form a mass which grows very slowly, and gives an apparently solid character to the cyst. The colour of the hair generally differs from that on the surface of the body, and is apparently related to it rather as that of a son or daughter than that belonging to the same individual. A tuft of hair has been recorded as long as five feet. Towards old age the hair may turn white, or be cast off, so that the cyst becomes bald.

The lining of the cyst sometimes develops mammæ, nipples without mammæ, or mammæ without nipples. Sometimes these are pseudo-mammæ, having no ducts or secreting structure. Sometimes the nipple is perforate, and communicates with glandular tissue in the mamma, having acini and regular glandular epithelium. Von Velits* has described a perfect example of a mamma which yielded milk and colostrum.

Horns resembling those which grow from sebaceous cysts may be found on the surface, and nails have been described growing from a finger-like skin-covered projection.

The wall of a dermoid cyst is generally thick, and has not the bluish translucent appearance of an ordinary ovarian cystoma. There is a layer of cellular tissue, which may contain fat, under the skin-like surface.

Dermoid cysts are more frequently single and unilateral. Sometimes, however, they are bilateral. Less frequently, one cyst in an ordinary cystoma is dermoid, or skin and hairs may be developed on one part only of the lining of an ordinary ovarian cyst.

Dermoid cysts are more liable to suppuration than ordinary ovarian cystoma. Occasionally they show a tendency towards malignancy. Part of the stroma may be sarcomatous. Metastases may in such case be found in the viscera; or there may be malignant recurrence locally after removal. Occasionally there seems a tendency to metastasis without absolute malignancy. Dermoid cysts have been found at other parts of the abdomen in conjunction with a dermoid cyst of the ovary. Occasionally fat-containing cysts are developed in the adherent abdominal wall and other adjacent parts. In one such case which I have met with, in which the dermoid cyst of the ovary had been of very many years' standing, the dermoid was successfully removed; but sinuses opened in the abdominal wound after a time, and fatty matter was discharged. For a time the case appeared to be running a malignant course, but eventually the sinuses closed up, and the patient was alive and well many years after.

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* Virchow's "Archiv.," Bd. cvii. s. 505.

Dermoids may grow to a very large size, and one weighing 160 pounds has been recorded. They are common in early life and even infancy as compared with other forms of cystoma. Of tumours of the ovary occurring under the age of fifteen nearly half are dermoid cysts, and about a quarter are malignant sarcoma or carcinoma. Bland Sutton holds that the malignant tumours in the ovaries of children are histologically distinct from the common forms of sarcoma or carcinoma, and proposes to call them *oophoromata.* Histologically they resemble the connective tissue of the fœtal ovary; but towards puberty they tend to assume an alveolar arrangement and resemble carcinoma. The growth usually affects both ovaries simultaneously, but may be limited to one ovary.

Causation.—The far more frequent situation of these cysts in the ovary than anywhere else shows that they cannot be the produce of an included twin ovum, for such an ovum would be attached to some more external part. Moreover, a dermoid cyst has sometimes contained far more than thirty-two teeth. The occurrence in them of structures other than epithelial, as well as their situation, distinguishes them from cysts formed by abnormal epidermic involution, like the dermoid cysts of the orbit, and from dermoid cysts arising from the imperfect closure of some fœtal tube which ought to disappear before birth, such as the branchial clefts. In these latter cases only cutaneous structures with hair and cutaneous glands are found. Dermoid cysts containing teeth have, however, been found in connection with the mouth and the rectum, where they, perhaps, may be regarded as an imperfect effort of nature to provide something useful in connection with the alimentary canal. Thus they have been found between the rectum and the bladder in the male sex.

In rare cases dermoid cysts, containing bones and teeth, have been found in the peritoneal cavity, as, for instance, attached to omentum or mesentery, the ovaries being healthy. As most, if not all, of such instances have been in the female sex, there is some ground for believing the possibility that they may have originated from an unimpregnated ovum which had attached itself to the peritoneal surface.

The most probable view of the origin of dermoid cysts of the ovary is that they are an instance of imperfect parthenogenesis, or development of germ plasm without union of the sexes. According to Weissman's theory the cells which form the germ plasm are entirely distinct from those which form the body plasm, and are devoted to reproduction only. The occurrence of complete parthenogenesis, or development of germ plasm into individuals without any sexual union, in animals so highly developed as aphides and bees, affords some support for the idea that an imperfect attempt at parthenogenesis may occur in even higher animals: so that an unimpregnated ovum produces in an irregular way some of the normal tissues of the body. Thus a bird in captivity will sometimes begin to lay eggs when getting old, though no coitus has ever occurred.

This view is somewhat supported by the occurrence of similar tumours, and of the malignant tumours called embryomata, in the testicle. In the very rare cases in which an embryoma has been found in some other part of the body, as the mediastinum, it may be supposed that a fragment of the germ plasm, which normally should be concentrated in the ovary and testicle, has been included elsewhere.

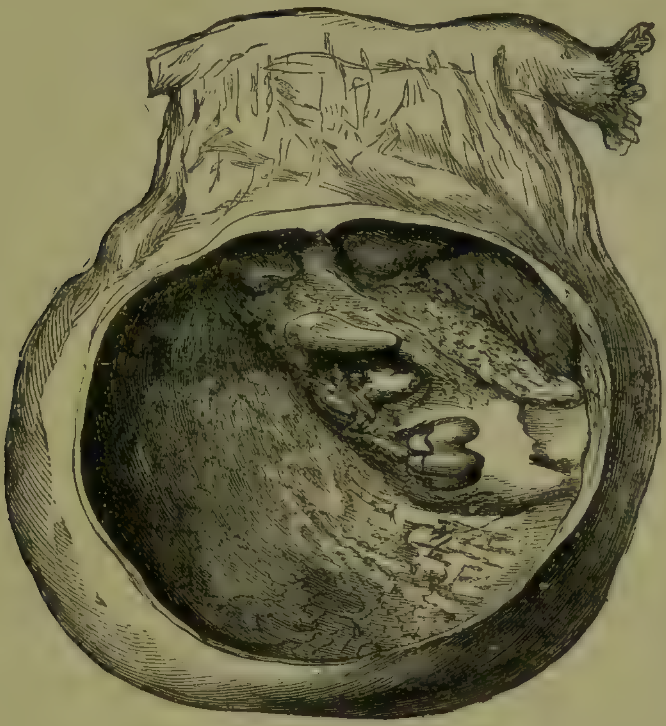

Fig. 243.
Dermoid Ovarian Tumour, bearing Teeth and Bone. (Doran.)

Dermoid cysts of the ovary have often been found in very young children, but they more frequently come under observation within a few years after the age of puberty. It is probable that, in at any rate a large proportion of cases, the tumour commences in fœtal life or soon after birth, while formative energy is specially active, and that it takes on a more active growth when the ovary becomes developed at the age of puberty. As dermoid cysts are occasionally found associated with ordinary ovarian cystomata, it is possible that, in such cases, the presence of the dermoid tumour may have been the starting point of irritative stimulus.

Results and Symptoms.—Dermoid cysts are slow in progress, and do not generally pass beyond a small or moderate size. In exceptional cases they may attain a large size, from the accumulation of many years' secretion, or from suppuration of the cysts. They are also more prone than ovarian cystomata to undergo inflammation and suppuration, and to contract adhesions with surrounding parts. Fistulous openings may then be found, communicating with the rectum, bladder, surface of abdomen, or other parts, through which the contents of the cyst, with hair, teeth, and bones, may be discharged. Rupture into the peritoneal cavity is rare. It is seldom that the cyst is completely evacuated spontaneously, but suppuration and discharge may continue for years.

Diagnosis.—The existence of a dermoid cyst may be suspected if a tumour of slow growth be found, which first attracted notice soon after the age of puberty, or has existed indefinitely, especially if hard masses like bone can be felt in parts of it, while no very manifest or superficial fluid thrill can be detected. A similar opinion may be held if, in a tumour like that just described, signs of inflammation appear, while the tumour rapidly increases and fluctuation is developed. A dermoid cyst may feel so hard as to simulate a solid tumour, especially if filled with a mass of hair, and so may be mistaken for a uterine fibroid. Positive diagnosis can generally only be made at the time of operation. The dermoid cyst may sometimes be recognised by its thick walls or bony portions. Otherwise it is decisive sign if, when the cyst is tapped, any small hairs are seen to escape with the fluid.

Treatment.—If a swelling is detected which is thought likely to be a dermoid cyst, it is important, in view of the changes to which such a growth is liable, to remove it as early as possible by ovariotomy. Operation especially should not be delayed if any signs of inflammation appear. Ovariotomy may even be undertaken after a fistulous opening has existed for a long period. In general, if a fistulous opening has been formed, the plan of enlarging the opening and evacuating the contents as completely as possible should first be tried. Tufts of hair may be extracted by a small blunt hook. A large drainage tube should afterwards be inserted, and the cavity washed out regularly with a weak solution of iodine or other antiseptic. Dr. Barnes recommends light cauterization of the interior of the cyst, to alter its character and cause it to contract. But a permanently discharging sinus is very likely to remain. If bones or sessile teeth are discovered, removal of the whole tumour is the only chance of cure.

If in the operation of ovariotomy a cyst is recognised as dermoid by its thick wall, as soon as it is exposed it is better to enlarge the abdominal incision and remove it without tapping.

MYOMATA OF THE OVARY.

Myomata or fibro-myomata of the ovary are rare, but are said to be commoner than fibromata. Involuntary muscular fibre exists in the ovary in continuity with the ovarian ligament. Myomata may thus originate in the ovarian ligament or in the ovary itself. The structure is similar to that of fibroid tumours of the uterus. It is to be remembered that spindle-celled sarcoma is difficult to distinguish microscopically from myoma; and thus doubt has existed as to the malignancy or otherwise of some tumours. The proportion of muscular fibre to fibrous tissue varies in different cases.

Myomata grow comparatively slowly, and are generally distinguished in this way from sarcoma. They may reach a considerable size, such as fifteen pounds in weight.

FIBROMATA OF THE OVARY.

Fibromata of the ovary are said to be even more rare than myomata. In the majority of cases the tumour is circumscribed, but sometimes it enlarges the whole ovary uniformly. The structure consists of interlacing bands of fibrous or connective tissue (Fig. 244, p. 524). Fibromata of the ovary grow slowly, and most cases recorded have been of small or moderate size, but some have attained a large size. There has sometimes been a doubt whether there was any tendency to malignancy in the tumour; but recurrence has not taken place after removal.

Diagnosis.—Solid tumours of the ovary are often difficult to distinguish from sub-peritoneal fibroid tumours of the uterus.

It may be possible to make out that the tumour is attached to the uterus, not by any continuity of tissue, but only by the ovarian ligament. The differential diagnosis is aided by the administration of an anæsthetic, by drawing down the cervix with a vulsellum, and by the combined rectal and vaginal examination. A fibroma cannot be distinguished from a myoma before operation, and generally a microscopic section is necessary to determine the point. A myoma or fibroma is generally distinguished from a malignant tumour of the ovary by its slow growth, unilateral character, and greater hardness.

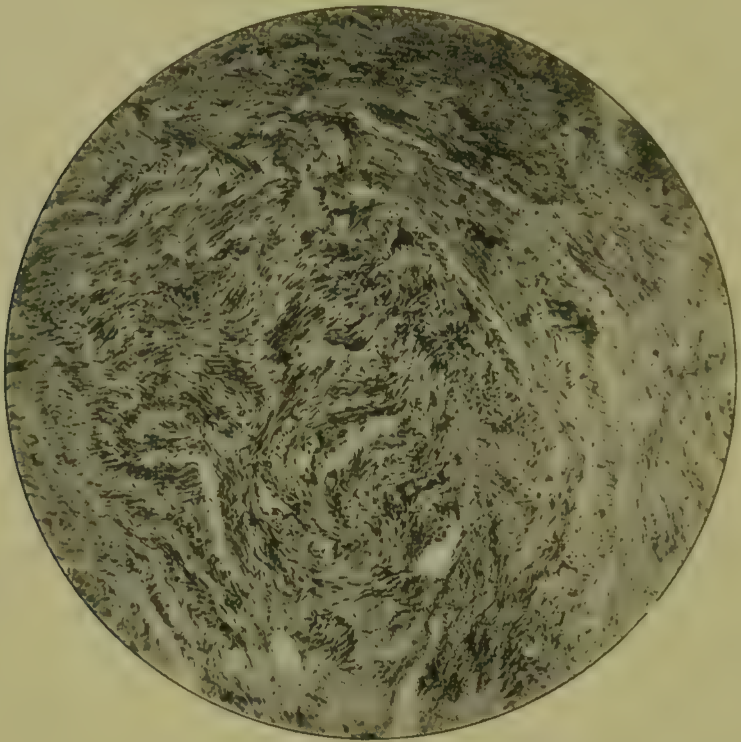

Fig. 244.—Fibroma of Ovary.
Micro-photograph by Dr. E. S. Worrall.

Treatment.—If the diagnosis is made the tumour should be removed by ovariotomy, since the operation is generally easy; and it is not possible to be certain before operation that the tumour may not be a spindle-celled sarcoma.

CANCER OF THE OVARY.

The ovary occupies a rather exceptional position among organs of the body, as being a not unfrequent seat of secondary, as well as of primary cancer. Secondary cancer of the ovary has been observed most frequently in association with carcinoma of the uterus, breast, stomach, or intestine, and with melanotic sarcoma.

The commonest form of primary cancer of the ovary is cysto-carcinoma or adeno-carcinoma. In some cases this appears to be a degeneration of what was at first an ordinary cystic adenoma, especially one with intra-cystic papillary growths. There is almost always a tendency to papillary growth which may increase so much as to rupture the cysts and proliferate externally, while at the same time the stroma is infected with atypical glandular epithelium (Fig. 245). The cyst walls are often very thin and rupture spontaneously, and then metastases are set up over the peritoneum. Hæmorrhage may also occur into the cysts, may rupture the cysts, and continue into the peritoneal cavity. The tumour may become adherent to surrounding parts, and then malignant infiltration spreads into them. Metastases occur first to the peritoneal surface, and later to the glands and viscera, as liver and lungs.

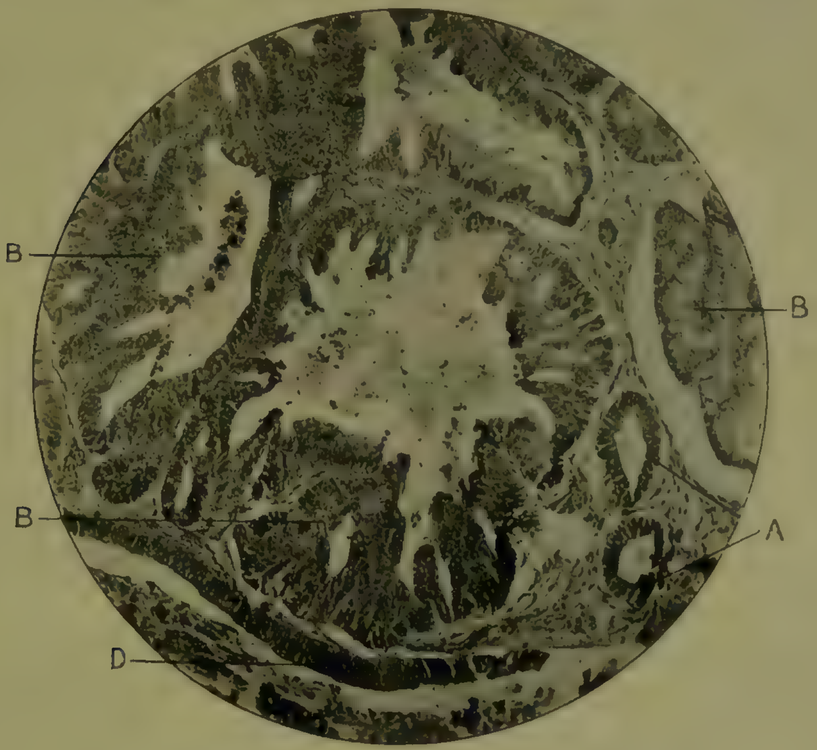

Fig 245.—Adeno-carcinoma of Ovary.
A, glandular cavities; B, malignant proliferation of gland epithelium, D, epithelium in stroma resembling one side of a gland.

In other cases the malignant character seems to be present from the first. The cystic element is less in proportion, and the growth consists mainly or wholly of a soft solid, giving a copious milky juice when the cut section is scraped. Generally the structure is that of atypical glands, with epithelium infiltrating the stroma. In some cases the growth must be described as malignant adenoma rather than carcinoma, the glands merely proliferating exuberantly without great alteration of their character, or infiltration of the stroma with gland epithelium.

The tumour is generally diffused, and smooth on the surface, but sometimes lobulated. In the earlier stage it is free from adhesion. It is more often bilateral than an ordinary ovarian cystoma, and metastasis may occur in the other ovary. It is more likely to set up peritoneal effusion, even in the absence of any extension to the peritoneum.

In some solid tumours occurring in young girls about or before the age of puberty, the structure is described as that of carcinoma, consisting of uncemented epithelium-like cells lying in alveoli. According to Bland Sutton, these form a special kind of growth, which he proposes to call oophoroma, but are rather sarcoma than carcinoma in their origin.

A special form of malignant tumour of the ovary is described under the title of *endothelioma*, which occupies an intermediate position between carcinoma and sarcoma. It was described first by Leopold in 1874, under the title of lymphangeioma cystomatosum. Marchand, in 1879, introduced the term endothelioma, considering the growth to arise from the endothelium of the lymph or blood-vessels.

The tumour may be of any size up to that of a man's head. It is usually unilateral, though bilateral tumours have been observed. In shape it may be rounded or lobulated. The consistence may be firm or soft. Usually the tumour has a short pedicle, and it frequently forms adhesions to the surrounding structures.

On section the cut surface is of a yellow, gray, or white colour. It may be soft and friable, with a copious milky juice. It may be of fibrous structure, with nodular areas of softer consistence. It may be made up of innumerable small cysts in a rather dense stroma, thus presenting a honeycombed appearance.

Three forms have been distinguished in its histological structure: (1) Chains of cells often branching, lying in clefts in the stroma; (2) gland-like formations, the lumen often encroached upon by several layers of polymorphous cells; (3) groups of epithelioid cells lying in alveoli in a rather dense stroma.

All three types may occur in the same tumour; and may also be combined with cystic adenoma; with dermoid cysts, or with adeno-carcinoma. The tumours run a malignant course like carcinoma.

Sarcoma originates in the connective tissue of the ovary, and may be either round or spindle-celled. It is generally diffused throughout the ovary, and is bilateral in about half the cases. Some of these, however, may be cases of metastasis. It appears to be most frequent between the ages of twenty and thirty. But of tumours occurring before the age of puberty it forms about a quarter, and is about as common as cystic adenoma. It has been observed even in the fœtus at birth. In general, sarcoma of the ovary is much less frequent than carcinoma; but Pfannenstiel, in 400 ovariotomies, found sarcoma, including endothelioma, in the proportion of 5·38 per cent.

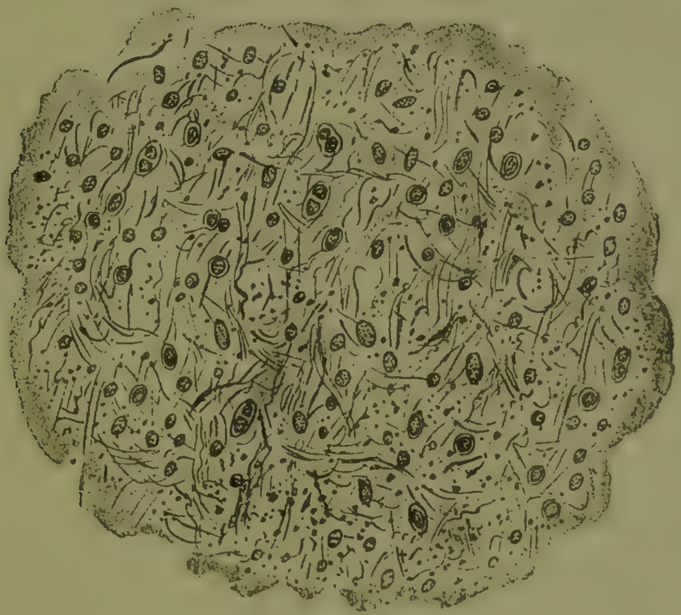

Fig. 246.—Sarcoma of Ovary.

Round-celled sarcoma is commoner than spindle-celled (Fig. 246). It forms a soft, friable, solid tumour, from the section of which copious milky juice can be scraped. It is highly vascular, and cystic spaces may be formed by hæmorrhage or the breaking down of tissue. In many tumours both round and spindle cells are present. In other cases the structure is that of fibro-sarcoma and the degree of malignancy less.

The tumour is usually round or lobulated, with a smooth surface. It is free from adhesions in the earlier stage, but soon sets up peritoneal effusion. It may grow to a size of thirty pounds or more; but more often general malignant infection takes place while it is comparatively small. Metastases occur to the peritoneum, and early metastases also to the viscera, as the liver, lungs, and kidneys. Myxomatous degeneration may occur in the tumour. The degree of malignancy varies according to the structure, being greatest in proportion to the number of round cells. In general, the prognosis is similar to that of carcinoma.

Diagnosis.—The solid character of a growth in the ovary should always excite the suspicion of its being malignant; and the suspicion is increased if both ovaries are affected, if pain is severe, if the growth is rapid, if a large quantity of ascitic fluid is present, or if the cachexia and emaciation of the patient, or local or general œdema, are greater than can be accounted for by the size of the tumour. The patient's age is also an element in diagnosis. If the tumour becomes fixed to the uterus and surrounding parts, and nodular masses are felt in its neighbourhood, especially if nodules are felt from the vagina or rectum in the cellular tissue of the broad ligaments, or utero-sacral ligaments, the diagnosis becomes pretty certain. Examination of the ascitic fluid may also give distinctive signs.

Treatment.—Any solid tumour of the ovary which appears to be free from serious adhesion should be removed without delay. If either a solid or a cystic tumour appears to be firmly adherent in the pelvis, and there are nodules in the cellular tissue indicating malignant extension, no operation should be performed as a rule, beyond the letting out of any peritoneal effusion. In case of doubt whether the tumour is malignant, or whether surrounding parts are really infected, an exploratory incision should be made to see if the tumour is capable of removal. If a tumour of one ovary is found to be cancerous on removal, it is generally advisable to remove the other ovary also, even if there is no obvious disease in it.

After the making of an exploratory incision when a tumour has been diagnosed as malignant, or if evidence of malignancy appears on opening the abdomen for removal of what was supposed to be a simple cystoma, the peritoneum should be carefully examined for metastatic nodules. If any are found, removal of the tumour should not be attempted, unless it is free from adhesion, but the peritoneal cavity should be emptied as thoroughly as possible of fluid. If there are no metastatic deposits visible. but the tumour is evidently malignant and firmly and extensively adherent, especially if it is adherent in the pelvis, it is to be remembered that malignant extension has probably taken place at the adherent sites, and that separation of the tumour may cause fatal hæmorrhage. If the abdomen is closed without any separation of adhesions, the patient will probably recover from the operation, and may live for some time. If the operation has to be abandoned after separation has been commenced, the prognosis is very unfavourable.

Tubercle of the Ovary is very rare as a primary affection. The ovaries may be affected by tubercle in general tuberculosis, in tubercular peritonitis, or tubercle of the Fallopian tubes. Miliary tubercles may be found on microscopic section even when there is no obvious disease. Miliary tubercle occurs chiefly in the cortical zone. Caseating foci may be formed, most often in the stroma, but sometimes in the Graafian follicles. If they increase in size, these constitute one form of ovarian abscess.

In tuberculosis of the genital tract, the ovary is affected less often than the Fallopian tube, or the endometrium, but more often than the cervix, vagina, or vulva.

Treatment will be considered in conjunction with that of tubercle of the Fallopian tube.

CHAPTER XI.

DISEASES OF THE FALLOPIAN TUBES.

The Congenital Anomalies of the Fallopian tubes dependent upon imperfect development of Müller's ducts have been considered in connection with those of the uterus (*see* p. 116). Another congenital anomaly is the formation of one or more supplementary openings into the peritoneal cavity, which have each a fringe of fimbriæ. These are of little practical importance. The effect of congenital closure of the ostium will be considered in connection with hydrosalpinx.

SALPINGITIS.

Causation.—Acute salpingitis arises by the extension of microbic infection upwards from the uterus, or, in the case of tubercular inflammation, downward from the peritoneal cavity. Gonorrhœal infection is the commonest; next to that, infection by septic cocci, especially in connection with parturition or abortion. Slighter forms of catarrhal salpingitis may be the sequel of acute microbic infection, or the result of less virulent gonorrhœal or septic microbes, or other microbes causing uterine catarrh, or of influenza or other zymotic diseases, or toxins produced by other causes.

The nature of the microbes has been tested chiefly in chronic stages of the disease, when the tubes have been removed by operation. Menge reports the result of bacteriological examination in 122 cases of purulent salpingitis, with or without pyosalpinx formation. The contents of the tubes were free from bacteria in seventy-five cases; in forty-seven cases they contained bacteria, in pure culture in forty-four cases, mixed in three. In twenty-eight cases the gonococcus was found alone; in nine, the tubercle bacillus alone; once Staphylococcus pyogenes alone; once colon bacillus alone; once an anaerobic diplococcus alone.

It may be presumed that where no microbes were found the bacteria had died out, and the pus become sterile. Thus is explained the fact that cases of pyosalpinx may remain quiescent, and that pus escaping into the peritoneal cavity in operations on tubes may be innocuous.

Pathological Anatomy.—In acute salpingitis there is infiltration of inflammatory cells in the plicæ, and to some extent in the tube wall adjoining. The epithelium is not destroyed in the milder cases, but may be denuded in the more acute.

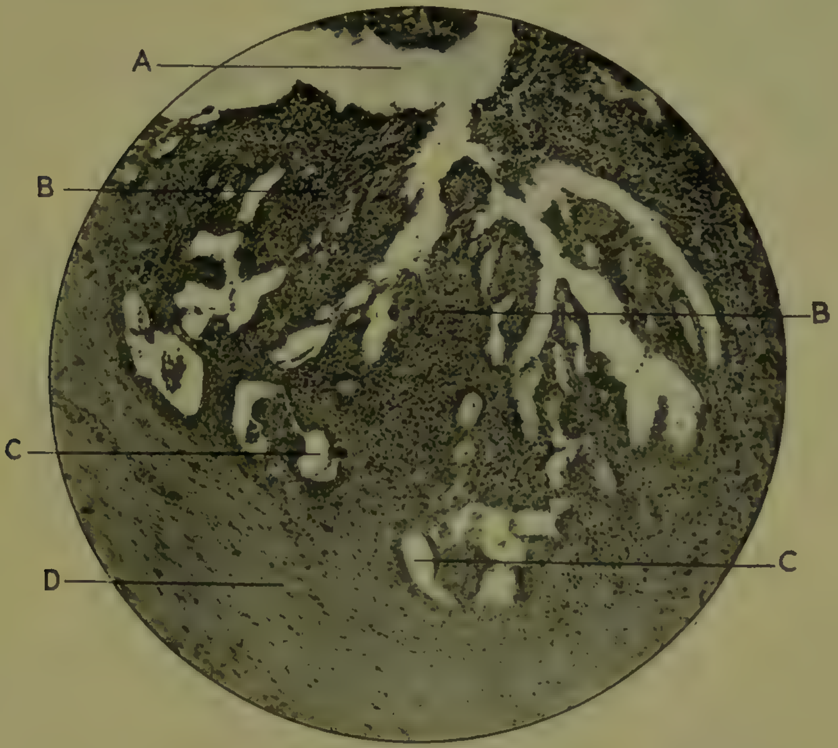

Fig. 247.—Catarrhal Salpingitis.

A, lumen of tube; B, hypertrophied plicæ, infiltrated with inflammatory cells and denuded of epithelium; C, gland-like spaces, formed by adhesion of plicæ, and lined with epithelium; D, muscular wall of tube.

In chronic catarrhal salpingitis there is hypertrophy of the plicæ through inflammatory infiltration and loss of their epithelium. The plicæ become broad and blunted, and may adhere together, diminishing the lumen of the tube. Spaces between the plicæ near the tube wall may be shut off, forming gland-like spaces, still lined with epithelium (*see* Fig. 247).

In slighter forms of catarrhal salpingitis of long standing, the epithelium is not lost, and the condition histologically is rather that of proliferation of the plicæ than inflammation, being analogous to the diffuse adenomatous hypertrophy of the endometrium which results from chronic endometritis. The tube wall may remain thin, but the whole tube is enlarged by hypertrophy of the plicæ, and may feel externally as if it contained a little fluid, the ostium being often occluded. On transverse section of the tube, no fluid escapes, but the plicæ protrude like a rosette from the cut section. In cases where the inflammation is or has been more acute, the whole tube wall is affected, and becomes much thickened by inflammatory infiltration and hypertrophy of the muscular wall, or fibrous tissue, or both. In this case the plicæ are generally disorganised rather than hypertrophied.

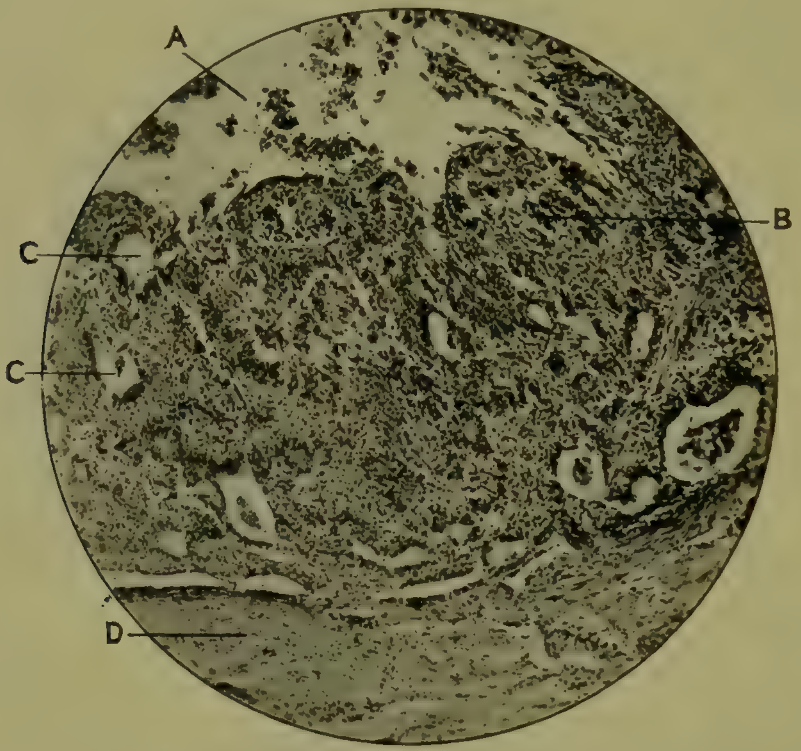

Fig. 248.—Purulent Salpingitis forming the early stage of Pyosalpinx.

A, lumen of tube containing inflammatory débris; B, remains of thickened plicæ; C, spaces showing remnant of glandular epithelium; D, muscular wall infiltrated with inflammatory cells.

In more severe and purulent inflammation, the epithelium is mostly destroyed, and the plicæ disorganised. The lining of the tube is converted into a layer of inflammatory material, in which some trace of thickened plicæ may still be visible, and sometimes gland-like spaces still containing epithelium (Fig. 248). The muscular wall is more or less infiltrated with round inflammatory cells. In the chronic stage of pyosalpinx all trace of the lining membrane is lost, and the muscular wall is merely lined by a layer of inflammatory cells, like a pyogenic membrane.

In salpingitis the fimbriæ of the ostium become thickened and shrunken up, and the ostium is frequently closed. This closure is effected in one of two ways. In the first, when the tube wall is thickened by inflammatory infiltration, the fimbriæ become shortened and drawn inward, and the orifice gradually contracted and closed, by the swollen and œdematous muscular wall becoming lengthened and bulging over it, until its margins adhere. In the second, the lymph produced by perimetritis binds down and covers in the fimbriæ. They adhere together, and to surrounding structures. Thus the tube is sealed up from without, and a protection formed against further infection of the general peritoneum by the contents of the tube. At the same time the tube becomes adherent to structures round, such as the ovary, broad ligament, uterus, pelvic wall, and bowel. Doran has given the name of salpingitic closure of the ostium to the former process, and perimetric closure of the ostium to the latter (Figs. 249 and 250).

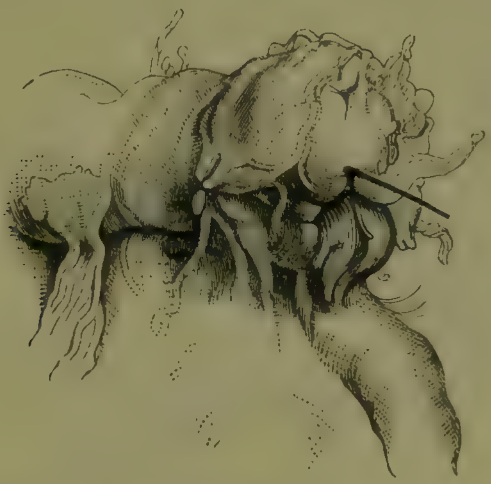

Fig. 249.—Fallopian Tube showing Salpingitic Closure of the Ostium.

A specimen showing complete obstruction of the ostium, the result of salpingitis. The end of the tube has been detached from the ovary below, and the ostium forcibly opened; a bristle passes out of its orifice. The tissues of the tube have swollen over the ostium, completely concealing the fimbriæ excepting the ovarian fimbria, which is seen below the bristle. Behind and above the bristle are perimetric bands, which must not be mistaken for fimbriæ.

(After Doran.)

Dilatation of the Fallopian Tube, without occlusion, in slight degree, may result from chronic inflammation of its lining membrane, which may produce also narrowing at other parts.

In more considerable amount, it is apt to be associated with the stretching out of the tube over uterine or ovarian tumours, or its fixation by old adhesions. Such an abnormal patency of the tubes constitutes the great danger which attends the injection of medicated fluids into the uterus. By allowing reflux of the menstrual blood, it is also believed to be one of the causes of peri-uterine hæmatocele. A considerable number of cases has been recorded in which it has been concluded that the uterine sound could be passed for two inches or more along the Fallopian tube. In some instances this has doubtless occurred, but some supposed cases are probably open to the explanation that the sound was first passed through a soft uterine wall, and that the opening remained for some time patent, so as to allow the sound to pass repeatedly in the same direction.

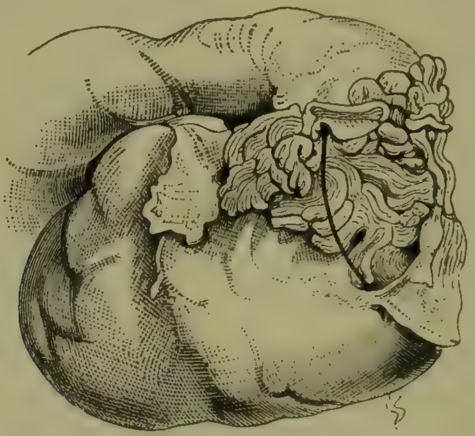

Fig. 250.—A Fallopian Tube showing Perimetric Closure of the Ostium.

An ovary and tube showing obstruction of the ostium by perimetric deposit, which forms a deep pouch around the orifice of the tube. The fimbriæ have been partly pulled out of the pouch. A bristle passes into the pouch out of the ostium.

(After DORAN.)

HYDROSALPINX.—When the ostium of the tube is closed by inflammation, the contents may still escape through the uterus. But the narrow uterine portion of the tube generally becomes more or less obstructed by inflammatory swelling of the mucous membrane, and then the tube becomes distended. The same result may follow from a kink of the tube, produced by adhesion, near its uterine end. As a rule, there is not an absolute anatomical occlusion of the uterine end of the tube. In some cases, clinical evidence appears to point to occasional escape of fluid from the Fallopian tube in gushes. In others it may escape gradually and unnoticed. In this way is explained the relative cure which is often attained by the shrinking up of a distended tube, and the gradual conversion of a pyosalpinx into a hydrosalpinx. In some cases a partial dilatation of the tube appears to coexist with a continuous escape of fluid through the uterus to an appreciable amount. Thus, I have met with cases in which there was a continuous uterine discharge of a peculiar fluid, such as a brown grumous fluid, associated with evidence of inflammation of the appendages. Dilatation and curetting of the uterus failed to cure or improve the discharge. On removal of the Fallopian tubes by abdominal section, they were found slightly distended with fluid similar to that which had formed the discharge, and the discharge was immediately cured.

The term hydrosalpinx is applied to a dilated tube when the contained fluid is thin and watery. There are two varieties of hydrosalpinx. In one the tube wall is thin and often translucent, and the tube may be free from adhesion, or may have comparatively slight and filmy adhesions. The condition may be unilateral or bilateral.

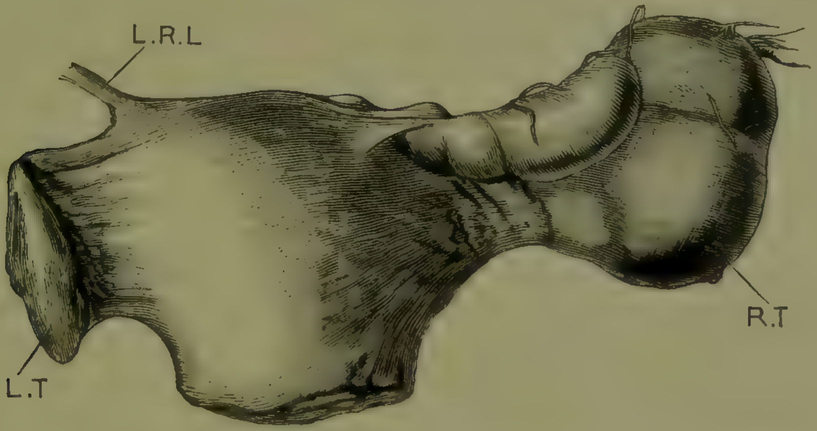

Fig. 251.—Distended Fallopian Tubes : Hydrosalpinx on Right Side, Pyosalpinx on Left.

R T, right tube; L T, left tube; L R L, left round ligament.

It is supposed that this variety may arise from a congenital occlusion of the ostium, if for any reason, such as a slight inflammatory swelling of the mucous membrane, the uterine end of the tube becomes blocked. It may also occur from infection of the tube by microbes of a low degree of virulence, which set up only catarrhal inflammation of the tube, but are sufficient to set up a slight perimetritis on reaching the peritoneal cavity, and thus bring about a perimetric closure of the ostium.

In the second variety of hydrosalpinx the wall of the tube is thicker, and adhesions generally more considerable. Occasionally it is unilateral; but more often it is associated with inflammation of the uterine appendages on the opposite side, and not unfrequently with pyosalpinx. This kind of hydrosalpinx may originate from infection by inflammation a little more severe than the last. It is probable that it may also be a later stage of what was originally a pyosalpinx. The microbes die out, and if the fluid oozes away very slowly through the uterus, it is eventually replaced by a watery secretion. This view is supported by the fact that the fluid, though not purulent, is often turbid rather than watery. Hydrosalpinx is rarely of large size, especially when it belongs to the latter variety, but has been recorded to contain as much as a quart of fluid.

PYOSALPINX, or distension of the Fallopian tube with pus, is the result of a more acute inflammation than hydrosalpinx, and, on that account, it is generally associated with more extensive peritoneal adhesions. Gonorrhœa is the commonest cause. According to bacteriological researches, tubercle bacilli are found more often than septic microbes; but it is probable that septic microbes more readily die out. The swelling formed by the dilated tube does not so often attain a great size as does that of hydrosalpinx. In some cases the fluid is intermediate in character, and may be slightly tinged with blood; so that it is difficult to say whether hydrosalpinx, pyosalpinx, or hæmatosalpinx is the most appropriate term.

In the majority of cases the distended tube, either in hydrosalpinx or in pyosalpinx, does not exceed an inch and a half in diameter. In rare cases, however, a dilated tube may attain the size of a fœtal head, or even be still greater. In one case, I have found thirty-six ounces of pus in one tube, and twenty-four in the other; the case simulating one of double ovarian tumour. In another case, an enormously distended pyosalpinx, with thickened muscular walls, had separated the layers of the broad ligament. and occupied a position like a broad ligament cyst, burrowing under the sigmoid flexure. In other cases, again, when there is extensive matting of the tubes and ovaries by perimetric adhesions, the tubes are found but slightly dilated by hydrosalpinx, the lumen not exceeding the diameter of a No. 12 catheter, the fimbriated extremity sealed. This condition comes within the definition of hydrosalpinx, but the hydrosalpinx is of trivial importance compared with the general effect of the adhesions.

In one case,* I met with a tumour reaching a hand's breadth above the umbilicus, which was mistaken for an inflamed ovarian tumour, but proved to consist of a double pyosalpinx, with a large opening between the tubes. The combined tubes contained sixty-four ounces of pus. Evidence of tubercle was found in the tube walls.

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* "Obstet. Trans.," vol. xlii.

In Fig. 252 is shown a large pyosalpinx, with the fundus uteri removed with it, somewhat enlarged by a diffuse fibroid. The figure, as well as Fig. 251, shows the characteristic retort shape assumed by the dilated tube. The enlarged ovary is seen attached to the tube. The retort shape is due to the way in which the tube naturally yields to fluid pressure, owing to the relative dilatability of its different parts, coupled with the fact that the ostium is united by the ovarian fimbria to the ovary and thereby to the angle of the uterus. In extreme degrees of distension there is often more convolution than that shown in the figure. In tubercular pyosalpinx, and in distension by soft growth, as papilloma or tubercle, the tube is generally banana-shaped rather than retort-shaped. The reason is that, in this case, the early distension is by a soft solid, rather than by fluid pressure.

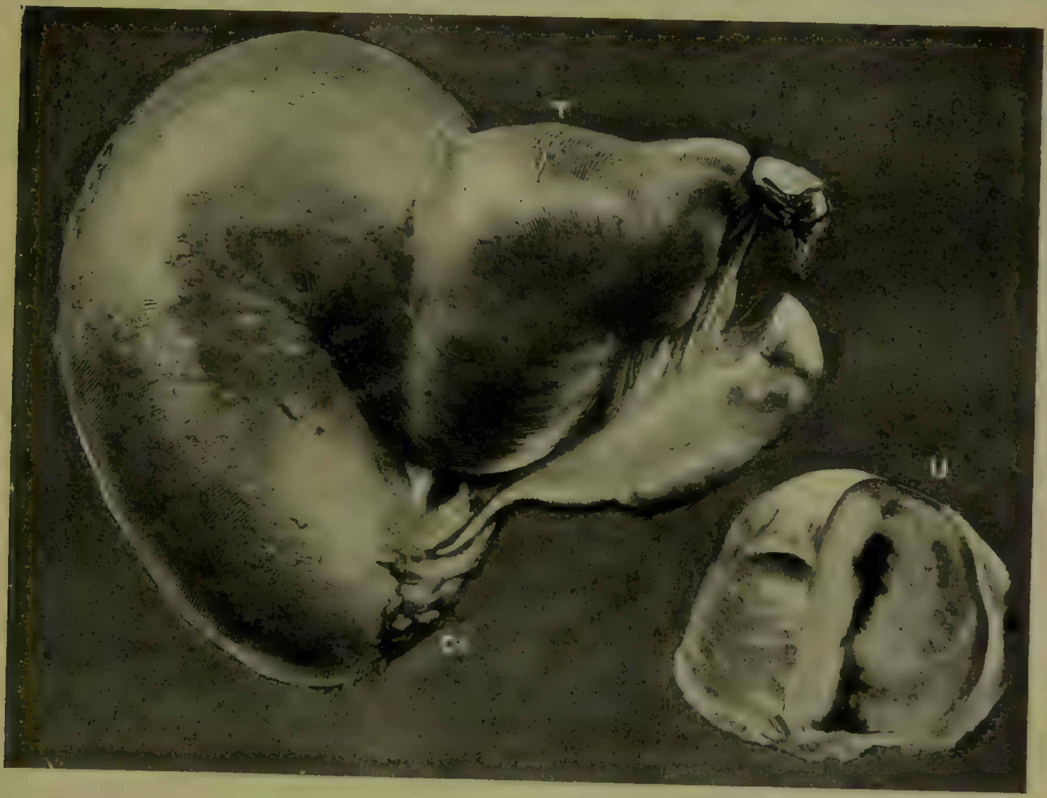

Fig. 252.—Large Pyosalpinx with Ovary attached.

T, Fallopian tube; OS, ostium; U, uterus enlarged by diffuse fibroid, removed at same time at level of internal os.

In ordinary pyosalpinx, since the distance from the angle of the uterus to the ostium is more or less fixed, the more the tube is distended, the more it becomes convoluted.

HÆMATOSALPINX, or distension of the tube with blood, may be a late result of atresia of some part of the genital canal, and retention of menstrual fluid. The tubes only become distended when the distension of the uterus is considerable and long-standing. Probably the first effect is a little escape of blood by reflux into the peritoneal cavity. This sets up slight perimetritis, which seals the ends of the tubes, and the tubes then become distended. Sometimes the tubes have been found distended with blood in atresia of the genital canal, although the opening into the uterus appeared to be closed. It does not seem, however, that normally there is any discharge of blood from the Fallopian tube in menstruation. Hæmorrhage may occur into the Fallopian tube when inflamed, or when already distended by pus or serum. The majority of cases of hæmatosalpinx have an inflammatory origin of this kind.

The commonest cause of hæmorrhage into the Fallopian tube is tubal pregnancy; but, in this case, the tube is generally filled with clot, or with a tubal mole, rather than with fluid blood or sanguineous fluid. If the ostium is open, and a mass of clot in the tube, the case is almost always, if not always, one of tubal mole.

Frequency.—The operation for removal of the uterine appendages in chronic inflammatory disease of the tubes, introduced by Mr. Lawson Tait, has shown that distension of the tubes is commoner than had been supposed. The results of post-mortem examinations confirm this to some extent, now that attention has been directed to the matter. Dr. Kingston Fowler found within three years, in the post-mortem room of the Middlesex Hospital, ten cases of pyosalpinx and five of hydrosalpinx. In eight of the fifteen cases the state of the tubes had been indirectly the cause of death, but in only two did this occur through rupture into the peritoneal cavity, one of these being a case of cancer. Five out of the fifteen were cases of cancer of uterus, ovary, or rectum. Dr. Lewers found seventeen cases of distension of tube, including five of pyosalpinx, in one hundred autopsies at the London Hospital. In two of these the pelvic condition was the cause of death. This proportion of cases is probably greater than the usual average, especially as regards the relative frequency of pyosalpinx. At Guy's Hospital during three years, 1884–1886, during which time

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the attention of the pathologists had been especially directed to diseases of the Fallopian tubes, there were three hundred and two autopsies of women above the age of puberty. Among these there were only two cases of pyosalpinx, including one case in which the tubes were dilated into two large symmetrical suppurating sacs, resembling, at first sight, ovarian tumours. There were eight cases of hydrosalpinx, including two in which the distension was trivial in amount, the tubes not being larger than a lead pencil. There were two cases of hæmatosalpinx, thus making twelve cases in all of distension of the tubes. There were fourteen cases of chronic adhesion of tubes and ovaries, without any distension of tubes. The pelvic condition was indirectly the cause of death in both the cases of pyosalpinx, in one case of hydrosalpinx, and in four cases in which there was only adhesion of tubes, without distension. There were three cases of tubercle of the tubes. In these three hundred and two cases, therefore, tubercle of the tubes was commoner than pyosalpinx. Chronic inflammatory disease or adhesion of tubes was found in nearly 9 per cent. of all the autopsies. There was no case of rupture of distended tube. The average age of patients with distended tubes was forty-one; of patients with adhesions only about the tubes, forty-three.

Results and Symptoms.—The symptoms of salpingitis in the early stage are generally merged in those of the perimetritis with which it is almost always accompanied, and will be considered under the head of Perimetritis.

In suppuration of the tubes, the pus which escapes before the ostium is closed sometimes, especially when septic in its origin, sets up general, and even fatal, peritonitis. More often only local inflammation is the result, and the tube becomes surrounded by adhesions. Localised peritoneal abscesses may be formed in the midst of such adhesions, or the ovary may become infected, and an ovarian abscess result. Sometimes both conditions are present together.

Hydrosalpinx in many cases appears to cause but slight symptoms, provided that there is no very extensive matting of surrounding parts from perimetritis. The swelling caused by the distended tube can often be recognized as less tender than a prolapsed ovary, when the two are separable. In other cases, however, when the distension of the tube is considerable, or when there is much matting around from adhesions, there may be severe and chronic pelvic pain. This is usually aggravated by menstruation, and the menstrual flow is often irregular, sometimes profuse.

The patient may be rendered a chronic invalid, or suffer from frequently-recurring attacks of illness.

In pyosalpinx the symptoms are generally more severe. Some rise of temperature is more common, and frequently there are repeated attacks of perimetritis. Metrorrhagia is not uncommon. A pyosalpinx may rupture and cause fatal peritonitis, but this appears to be uncommon. Death may also occur from chronic perimetric suppuration, ulceration, or obstruction of intestines. The fact that, in the post-mortem room, distended tubes are often found in women who have passed the menopause, while the average age of patients on whom the operation for removal of appendages is performed is under thirty, appears to indicate that a quiescent condition or a relative cure is attained in many cases. This applies especially to hydrosalpinx; but even in pyosalpinx the pus may eventually escape by the uterus, or become dried up.

The mortality, in the series of cases at Guy's Hospital quoted in the last paragraph, amounts to 28·8 per cent., as compared with the number of cases of chronic adhesion, and 2·3 per cent. as compared with the total number of necropsies. This appears to show that, although the primary perimetritis is rarely fatal, death from the result of tubal inflammation is by no means so rare as some have supposed. The fatal disease does not appear as perimetritis simply, but rather as general peritonitis, burrowing pelvic abscess, or, occasionally, as septicæmia, or apparent tumour.

A pyosalpinx may open spontaneously into bowel, especially into the rectum, into the vagina, into the bladder, or, rarely, the pus may make its way to an external surface. Often an intraperitoneal abscess is formed as an intermediate stage. Opening into the vagina is the most favourable, but that into the rectum the commonest. From either a natural cure may result. In other cases drainage is insufficient, and a sinus remains, or another pus focus may form a fresh abscess.

Diagnosis.—A distended tube, when of considerable size, is difficult to distinguish from a small ovarian cyst. The distinction may often be made by the fact that the swelling caused by a distended tube is retort-shaped, with the broad end curved downward, or apparently pyriform, with the smaller end next the uterus. During life the broad end of the retort is commonly nearer to the side of the uterus, and to the pouch of Douglas, than appears in Fig. 251, p. 535, which shows the specimen somewhat drawn out laterally. Frequently the broad ends of the tubes descend lower into the pouch of Douglas, and are approximated to each other as they become dilated, so that a common position, when both tubes are distended, is that shown in Fig. 253. In rare cases, the distended tube lies more forward, and may even overlap the anterior face of the broad ligament.

The diagnosis will be assisted if similar swellings are felt on both sides. In smaller degrees of distension, it is not always possible to distinguish whether the tube is distended, or only fixed and surrounded by adhesions. A swelling is felt, generally more or less fixed, often somewhat posterior to, and lower than, the normal position of the Fallopian tube. In the case of hydrosalpinx, the ovary, somewhat prolapsed, may often be distinguished separately, and the tube recognised as an elastic elongated body, curving round it. In pyosalpinx it more frequently happens that the tube is surrounded by such a mass of adhesions that the presence of fluid cannot be positively recognized by the finger, unless its quantity is considerable. In either case there may be more or less general induration of the pelvic roof from perimetritis. The diagnosis of chronic inflammatory disease of the uterine appendages is confirmed, if there is a history of a probable cause, in the shape of gonorrhœa or a febrile disturbance after delivery, and if one or more attacks of perimetritis have previously occurred.

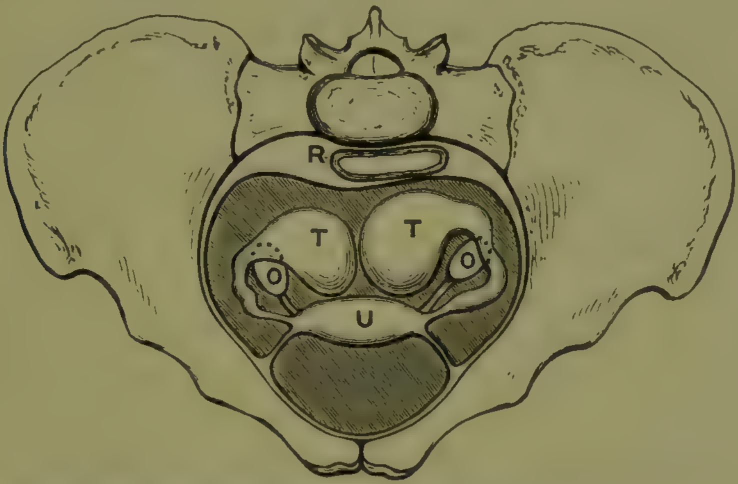

Fig. 253.—Diagram of common position of Distended Tubes, in relation to Uterus.

Treatment.—The operation for the removal of the uterine appendages in chronic inflammatory disease of the Fallopian tubes has rendered a cure possible for patients who might otherwise remain chronic invalids for many years. The operation should not be performed for the effects of a recent attack of perimetritis, since very great amendment, if not absolute cure, may then be attained by time. It is chiefly indicated when a patient has for years been a chronic invalid, sterile, and suffering from dyspareunia, especially if recurrent attacks of perimetritis, or, at any rate, of pain and pyrexia, occur, and if the symptoms are greatly aggravated by menstruation. If there is reason to believe that the disease is pyosalpinx, rather than hydrosalpinx, there is greater reason for performing it. Thus, if there are constitutional signs pointing to suppuration, and an elastic swelling diagnosed as a dilated tube, it is better not to delay operation. In many cases of hydrosalpinx, in which the distension is not very great, it appears to be unnecessary. In any given case, the amount of present suffering should be balanced against the risk of the operation, and the possibility of inconvenience from the physiological effects of oophorectomy, if it should prove necessary to remove both ovaries. In some cases, it may be sufficient to remove the appendages on one side only. More often both sides are found affected; and Lawson Tait contended that, even if this is not so, it is better to remove both tubes, on account of the probability that the second tube may become affected afterwards by another extension of endometritis.

The modern view is to avoid the removal of both ovaries, if possible. Thus, if the uterine appendages appear to be healthy on one side, that side is not interfered with. If one ovary, the right ovary for choice, can be separated from the tube and preserved, it is advisable to adopt that course.

The chief objection to preserving an ovary which has been adherent to a pyosalpinx is that some pus focus may be left in it. An exploratory puncture, however, may be made, if there is a suspicious spot in the ovary; and, if necessary, a part of it may be resected. Complete removal of both ovaries is generally followed by an artificial menopause. This is accompanied by nervous disturbances like those of the normal menopause, and sometimes more intense, especially if the patient be young. but these are not repeated at the usual age.

The operation is often spoken of as a mutilation; but this is only true in reference to pregnancy, and in most cases in which the operation is justifiable, pregnancy is already impossible. As regards sexual power, as a rule, there is no material change, except that the enhancement of sexual feeling which accompanies menstruation is abolished. In a few cases complaint has been made of a diminution of sexual power. In an action brought against a surgeon for the alleged unnecessary removal of the uterine appendages, a claim for damages has been made on this score. Sometimes, however, sexual feeling is increased after the operation. If the existing disease is producing dyspareunia, a woman is much more likely to gain than to lose in this respect, even if both ovaries are removed.

Short of operation, the treatment is that for perimetritis in its chronic stage (*see* Chapter XII.), especially hot water injection, moderate rest, counter-irritation over the seat of pain, and the administration of absorbents, such as perchloride of mercury, in small doses (*see* formula, p. 242).

Incision and Drainage.—If pyosalpinx has led to acute abscess formation, there is a serious risk in abdominal section, especially if the origin of the pyosalpinx was originally septic, for the suppuration will generally have extended beyond the tube to peritoneum or cellular tissue; and if a pyogenic cavity, other than the tube itself, is laid open from the abdomen, it cannot be removed, or satisfactorily shut off from the general peritoneal cavity. Under these circumstances, if there are pyrexia and other constitutional symptoms of acute suppuration, it is generally preferable to evacuate the pus locally if possible, in the first instance, and leave a more radical operation for a later date, if it is called for. If, however, the pyosalpinx has increased to a very large size, simulating a tumour, and especially if it is bilateral, the only resource may be removal of the whole, even in the presence of acute septic symptoms.

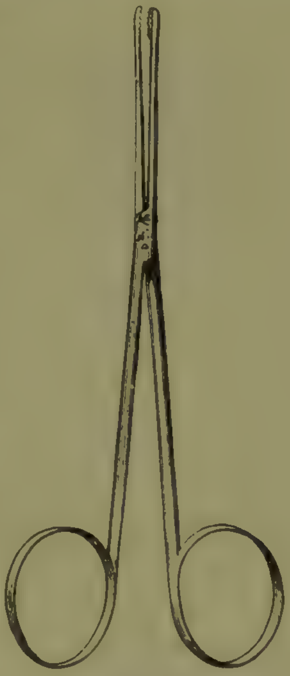

Fig. 254.
LISTER'S Sinus Forceps.

The case most frequently calling for local incision is that of a rapidly-increasing fluctuating swelling, felt from the vagina behind the cervix, and accompanied by irregular pyrexia, rigors, sweating, or other general signs of suppuration. It is then desirable to open the abscess from the vagina as early as possible, and so anticipate bursting into the rectum, which is the most probable spontaneous termination.

The patient is placed in the lithotomy position, the legs secured by leg rests or Clover's crutch. The cervix and posterior vaginal fornix are exposed by a short Sim's speculum. An incision is made with scissors through the vaginal mucous membrane, near the most prominent part of the swelling, but inside and posterior to the course of the ureter. The best mode of opening the abscess is to push into it through the vaginal incision narrow-pointed sinus forceps (Fig. 254, p. 543). As soon as these are felt to enter the cavity, the blades are separated to allow the pus to escape. The opening is then enlarged by stronger forceps and by the finger, until two fingers can be introduced. The cavity is washed out with an antiseptic, such as formalin ♏xx. ad Oj.

A self-retaining drainage tube is then introduced. A convenient form is Herbert Spencer's drainage tube. This is a large tube having horizontal wings at its upper end, which keep it in place, and fitted with an internal glass tube, which forms a lining for its upper three inches, and prevents its collapsing. To introduce it, the wings are pressed together and grasped by forceps.

A **T**-shaped drainage tube can also be used. Such a tube can be improvised out of an ordinary piece of stiff drainage tubing, an inch in diameter, in the following way. The tube is cut longitudinally through its centre, for about two inches from the end, and the terminal strips thus formed are cut to a point. At the base of each strip a large hole is cut in the wall of the tube, and the strip is inverted through the hole, the tip of it being drawn through from within outward by forceps. For the introduction of the tube, the strips are pressed together and grasped by forceps.

The abscess cavity can be washed out, if required, through the drainage tube, without removal of the tube, with a non-poisonous antiseptic, such as chinosol 1 in 400 or tinct. iodi ʒj–ij. ad aq. Oj. When the cavity is closing up, the tube may be replaced by a strip of iodoform gauze.

This method may lead to practical cure, just as spontaneous evacuation of an abscess *per rectum* may do so. If symptoms continue, due to the presence of other pus foci, a more radical operation must be performed later.

In comparatively rare cases, an acute abscess may point in some other direction, as on the abdominal wall above the pelvic brim. It should then be opened in a similar way. A superficial incision is made; forceps are pushed into the abscess cavity and expanded; the cavity is washed out with an antiseptic, and a drainage tube inserted.

Abdominal Salpingo-Oophorectomy.—This was the method first introduced for the removal of suppurating Fallopian tubes. Other alternatives to it are now practised, but it still remains the method most generally available for complete exploration and removal of all diseased structures.

The mode of operating first practised by Lawson Tait was to make a short incision, only sufficient for the introduction of two fingers, to separate the tubes by the guidance of touch only, wash out the peritoneal cavity, and introduce in all cases a Keith's drainage-tube of glass. It is preferable, however, to make a longer incision, separate intestinal adhesions in full view; and in this way the necessity for drainage can often be avoided

Trendelenberg's position is an aid to the operation; but the angle should not be so great as to cause fluid to flow out of the pelvis into the upper part of the abdomen. The incision should be fairly long, nearly as high as the umbilicus, and nearly as low as the pubes. The omentum will often be adherent to the pelvis, and require separation or division. Special care must be taken to tie all bleeding vessels in it. The small intestines are then pressed back out of the pelvis, and covered in by a flat pad or pads, which are packed around the pelvic organs, so as to make sure that any pus which may escape does not reach the general peritoneal cavity. If small intestines are adherent to the pelvic organs, each coil is carefully separated in succession by the fingers, or blunt instrument, or incision with scissors if necessary, until it can be packed away behind the pads. Any damage to muscular wall of intestine is repaired at once by sutures.

If a pyosalpinx is found of considerable size, it is advisable to evacuate it with an aspirator, and wash it out with an antiseptic solution, such as formalin, ℳxx ad Oj. For its wall may tear in removal, and the ostium may be only closed by adhesions to the pelvic wall, so that pus escapes when it is separated. It is, however, easier to separate the tube while it remains intact. This plan may be adopted if the pyosalpinx is small and thick-walled, especially if it can be made out that the ostium is sealed otherwise than by adhesion to the pelvic wall. If pus escapes from the tube, or pus loculi in the peritoneum are opened, the pus should be quickly mopped up with pads, and the infected area afterwards mopped over with the formalin solution.

In separating a distended tube, adherent in the pouch of Douglas, the best plan is to pass the fingers down in the centre behind the uterus and tubes, and seek for a line of demarcation between the tube and the bottom of the pouch of Douglas or the back of the uterus. The tube is then peeled off from below upwards and outwards in the direction of the broad ligament. until it is attached only by its natural connection with the broad ligament and uterus. The ovary will thus generally be separated and carried up with the tube.

If the uterine appendages are diseased on both sides, the simplest plan is to remove both ovaries with the tubes. If, however. one ovary appears to be healthy enough to justify its preservation, it must be carefully dissected away from the corresponding tube.

In the case of only slight adhesions, the result of former perimetritis, when there are no intestinal adhesions, and the tubes are not materially distended, the operation may be performed by the aid of touch, with a smaller abdominal incision. The fingers are passed down behind the uterus and free it from any posterior adhesions. The operator finds the ovary by tracing the ovarian ligament to it from the angle of the uterus, frees it from any adhesion, and draws it up into the wound. The tube is thus also drawn up into view and examined.

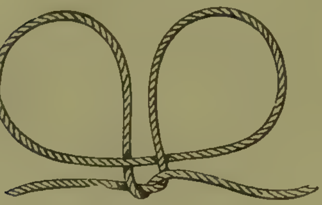

Fig. 255.
The Staffordshire Knot.
(After Lawson Tait.)

When the attachment of the tube. or tube and ovary, has been reduced to a pedicle, the pedicle should be secured in the way recommended for the pedicle of an ovarian tumour. The ovarian artery is first tied. Then the sharp-pointed pedicle needle (Fig. 199, p. 396), carrying a double ligature, is passed first from before backward close to the origin of the Fallopian tube from the uterus, then from behind forward through the ovarian ligament close to its origin, and then backward and forward through the broad ligament, so as to divide it into a number of segments. The two loops are then tied, and one loop is tied again round the whole. Lawson Tait recommended tying the pedicle by the Staffordshire knot. shown in Fig. 255. A loop is passed through the pedicle by transfixing with a pedicle needle. Then the centre of the loop is passed over the top of the tumour or tissue to be removed, and placed between the two free ends of the ligature, which are then tied over it. If the broad ligament has been torn in separating adhesions, it may be better to tie individual vessels, and then stitch together the peritoneal edges, as after hysterectomy.

Drainage is not generally required if the tubes have been removed intact, and hæmorrhage is satisfactorily arrested. It is essential if peritoneal abscesses have been opened, or if virulent pus, in a condition of acute sepsis, has escaped. Doubtful cases are those in which only a little pus has escaped locally in the pelvis, and is thought not to be virulent, the previous condition having been quiescent, especially when the origin has been gonorrhœal. But, if pus has escaped, and if also extensive adhesions have been separated, likely to cause much sanguineous oozing, it appears to be safer to drain.

The methods of drainage are described at p. 87. In this operation, I consider that, if the pouch of Douglas can be reached, a drain of iodoform gauze into the vagina is the best, since it does not lead to the leaving of a weak spot in the abdominal wall, nor to so much risk of a troublesome sinus. If an abscess cavity in the peritoneum has been opened, so that a pyogenic membrane is left, the opening into the vagina must be free. The abscess cavity must be filled with the gauze, and care must be taken that the opening from it into the vagina does not close prematurely.

Salpingo-Oophorectomy by Anterior or Posterior Colpotomy.—The former operation has been practised especially by Martin, of Berlin. The anterior pouch of peritoneum is opened from the anterior vaginal fornix after the method described at p. 294 for the operation of vaginal fixation of the uterus. The uterine appendages can then be explored, and any moderate adhesions separated. The fundus uteri can be anteverted and drawn out through the opening, and the tubes or ovaries removed as required. This method does not, however, allow of the separation of intestinal adhesions by the aid of sight, and is not suitable in the case of very firm and extensive adhesion.

Posterior colpotomy, in which an incision is made from the posterior vaginal fornix, appears to be a more direct mode of reaching the appendages. Neither of these methods allows so complete an exploration of all diseased structures and pus foci by the aid of sight as abdominal section. They are adopted with the idea that the mortality is less, but do not answer in the most severe cases. If, in either operation, adhesions are found which cannot safely be separated from the vagina, the abdomen may be opened.

Abdominal and Vaginal Hysterectomy.—Many authorities, especially in France and Germany, have considered that the uterus is a useless organ after the tubes have been removed, that it often still gives trouble afterwards if infected by sepsis or gonorrhœa, and that it is, therefore, better to remove it with the tubes. As regards the future of the patient, however, the mutilating effect, as regards sexual life, is probably greater if both uterus and ovaries are removed, than if one or other is left. If one ovary is left, there can be no objection to removing the uterus, except that it may increase the risk of the operation. If removal of the uterus facilitates the operation, as it may do in the case of very large double pyosalpinx, fixed deeply in the pelvis, it may be carried out on that account.

Again, if the uterus is much enlarged, if it has small fibroids in its walls, if it is the subject of troublesome retroflexion or retroversion, or if there is cervical or corporeal endometritis, it often gives a better and more rapid cure to remove the uterus with the tubes by the abdomen and leave one ovary, than to remove the tubes and ovaries on both sides. The mutilating effect on the patient is less, and the nervous effects of the menopause less severe, especially in young women.

Removal of the uterus by vaginal hysterectomy is the most effective means of cure, if there is a chronic sinus from an abscess originating from pyosalpinx, and discharging by rectum, bladder, or vagina. In the operation the abscess cavity is widely laid open, if not entirely removed, and the removal of the uterus makes a wide space for free and prolonged drainage through the vagina, which leads to the closing of any remaining cavity.

There are some cases in which, on abdominal section being undertaken for the removal of the uterine appendages, it is found that the whole pelvis is completely covered by firmly adherent intestines, so that neither uterus nor bladder nor any other guide for commencing the separation of adhesions can be distinguished. It may then be difficult or impossible to reach the ovaries and tubes from the abdomen without serious risk of tearing intestine. Under these circumstances, it is sometimes advisable to close the abdominal wound, and remove the uterus with the tubes and any other pus-containing cavities from the vagina. This can be effected without any communication between the vaginal wound and the free peritoneal cavity, so that there is no risk of the latter becoming contaminated by pus.

The most important aid in the operation is Martin's uterine vulsellum, shown in Fig. 154, p. 294, for by its means the uterus can be strongly drawn down and the fundus held firmly in any desired direction. The general method of the operation is otherwise similar to that of vaginal hysterectomy for cancer, described at pages 429—441. The first incision is made through the posterior vaginal fornix. No attempt is made to open the peritoneal cavity; but if any rounded lumps are felt, like distended tubes or abscess cavities, they are opened and washed out with antiseptic solution. The operator then continues the separation posteriorly up to the level of the internal os, keeping quite close to the uterine wall. Next, he makes the incision through the anterior vaginal wall, and separates the bladder up to the normal level of the anterior pouch of peritoneum, in the manner described at p. 432. Stout Doyen's clamps can now be placed at each side, so that their points just include the utero-sacral ligaments, and the uterus is separated laterally up to this level. After the division of the utero-sacral ligaments, the fundus can be pulled down lower without retroflexion or anteflexion. The operator can see its surface and peel off adherent intestines, or dissect them off with scissors, from the anterior wall first. By turning the handle of the vulsellum upward, he then partially retroverts the uterus, brings its posterior wall into view, and treats this in the same way. Finally, the extreme fundus is reached and freed, so that the finger can be passed over the top.

The uterus is now attached only by the upper halves of the broad ligaments. If it is desired only to remove the uterus, the thinner Doyen clamps may at once be placed on these at each side, and the uterus cut away. If it is intended to completely remove the tubes or tubes and ovaries, the uterus should be bisected by a sagittal incision. Each half is pulled down separately. The uterine appendages are thus brought within reach, are separated from adhesions, and cut away with the uterus, after the clamp has been placed on the broad ligaments outside them. Clamps only, and not ligatures, should be used in the operation. As soon as the clamps are removed there is free drainage of all the cellular tissue. Finally, the cavity whence the uterus was removed and the vagina are packed with moist iodoform gauze, 10 per cent. If a free peritoneal cavity is opened after the centre of the uterus has been reached, the operator may draw down the uterus by retroflexing it through the posterior opening, and, after its removal, stitch the peritoneal edges, as in the operation described at p. 431.

After the operation of abdominal salpingo-oophorectomy, if both ovaries are completely removed and menstruation arrested, endometritis generally tends to get well, in consequence of the atrophy of the uterus which ensues. Sometimes, however, it may persist in a form analogous to senile endometritis, and then curetting or other intra-uterine treatment may be required

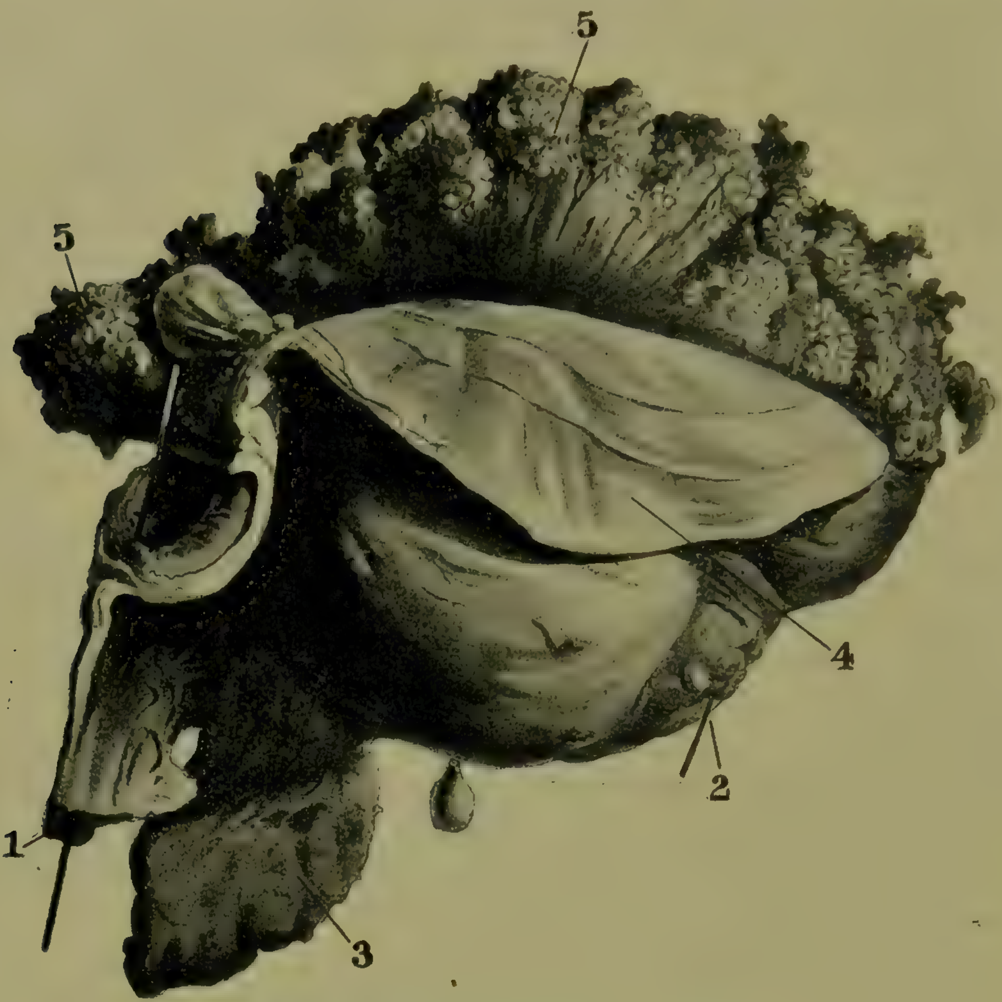

Fig. 256.—Papilloma of the Fallopian Tube.

A Fallopian tube enlarged and dilated by masses of papillomatous growths, which spring from the mucous membrane. They have not rendered the tube impervious, and a bristle is passed completely through it from the uterine end to the fimbriated extremity. During life a mucoid discharge issued from the tube and set up ascitic and pleural effusion. No secondary deposits were found, and the patient is alive now, twenty-two years after the operation. 1, uterine end of tube (a bristle is passed through this to the fimbriated extremity); 2, bristle issuing from fimbriated extremity of tube; 3, ovary, which is healthy (a small pedunculated cyst is seen below the tube near the ovary); 4, wall of tube, turned down to show growth inside; 5, 5, masses of papillomatous growth filling the tube.

(After Hubert Roberts, "Outlines of Gynæcological Pathology," Fig. 31, and Doran, "Trans. Path. Soc. Lond.," vol. xxxi., 1880, p. 174.)

afterwards. This is more likely to be the case if one or both ovaries are left.

Papilloma or Adenoma of the Fallopian Tube. — All new growths of the Fallopian tube are comparatively rare, but a considerable number have been described. The character of most of them is related to the longitudinal plicæ of the tube, which, without being actually glandular, produces an extension of surface lined with columnar epithelium which fulfils to a certain extent the function of glands. By proliferation of these plicæ arises a tumour springing from the lining of the tube, which has generally been called papilloma, but which is really adeno-papilloma. Bland Sutton proposes to call it rather adenoma. The surface consists of proliferating papillæ, having a stroma of delicate connective tissue, and covered with columnar epithelium (Fig. 256). Beneath the surface are generally gland-like spaces, also lined with columnar epithelium. These are probably formed from the grooves beneath the plicæ, like the similar spaces seen in chronic salpingitis. There is no invasion of the stroma by epithelial cells. Sometimes, however, a partial tendency to malignancy is shown by spread of the papilloma over the adjacent peritoneum. This may die out after removal of the original tumour. In some cases there is a more pronounced glandular character, and the growth looks like a bunch of vesicles or grapes.

Symptoms and Diagnosis.—The most marked associated symptom is hydro-peritoneum, which may be produced directly by the fluid secreted by the surface of the tumour, but may be also due in part to irritation of the peritoneum set up by this fluid. In some cases, when the ostium has been closed, gushes of watery fluid have taken place through the uterus. In many cases there has been a history pointing to chronic tubal inflammation. A positive diagnosis can rarely be made before operation, but adeno-papilloma of the Fallopian tube may be suspected if an increasing lump is found in the situation of the Fallopian tube, associated with fluid in the peritoneum.

Treatment consists of removal of the tube by abdominal section.

Myoma of the Fallopian Tubes is very rare, and, in recorded cases, has not reached a sufficient size to be of serious consequence.

Carcinoma of the Fallopian Tube generally has a papillary surface in the earlier stages, and originates in the same way as papilloma, or constitutes a malignant degeneration of papilloma. The tube is dilated and filled with soft, spongy, vascular papillary masses (Fig. 257). The superficial portions are often necrotic. Epithelial masses invade the stroma of the papillæ, penetrate the tube wall, and may reach the peritoneal surface and proliferate there. Sometimes gland-like tubules are seen, lined with columnar epithelium, and indicating the adenomatous origin of the growth. In the deeper parts, uncemented atypical cells may be seen lying in alveoli, so that the growth has assumed the character of medullary carcinoma. In advanced cases the tube becomes adherent to surrounding structures, or it may be bound down by pre-existing inflammation. The cases described have occurred between the ages of thirty-six and seventy, and in the great majority the age has been over forty-five.

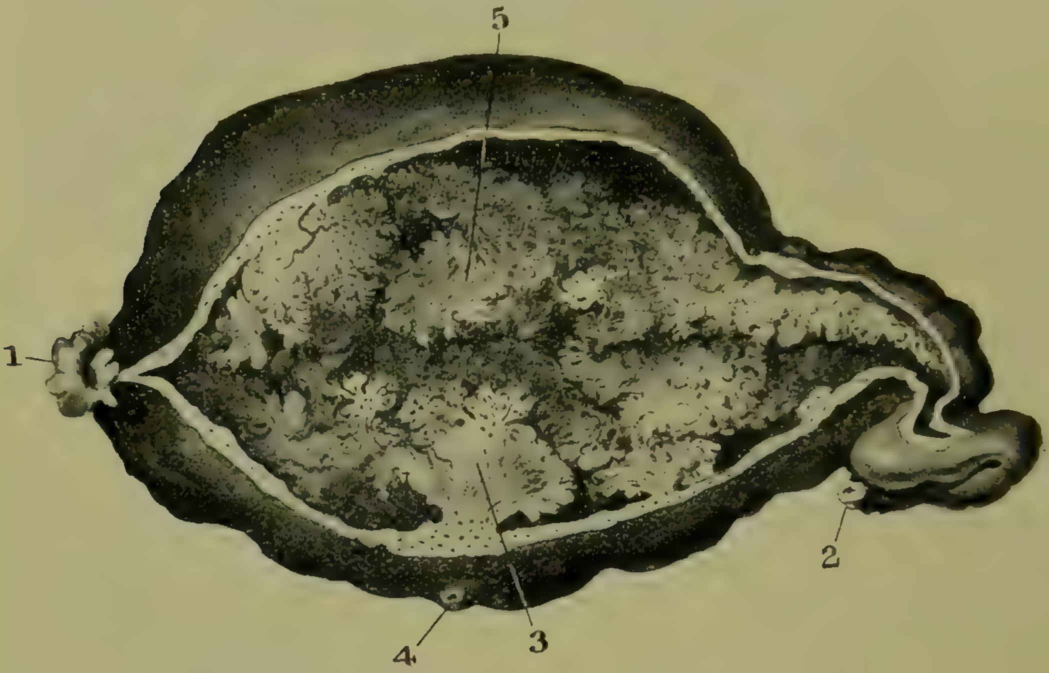

Fig. 257.—Primary Carcinoma of the Fallopian Tube.

A Fallopian tube much enlarged and distended by a mass of cancer. The whole tube is filled with growth to within an inch of the uterine end; in places the walls are invaded to the peritoneal surface. The lumen of the tube was filled with sanious fluid. The age of the patient was forty-three; recurrence took place eight months after the operation. The tube was the size of a Bologna sausage. 1, fimbriated extremity of the tube, which is closed; 2, uterine end of tube; 3, mass of cancer invading the wall of the tube; a nodule (4) has reached the peritoneal surface. 5, masses of flocculent breaking-down growth occupying the lumen of the tube.

(After Hubert Roberts, "Outlines of Gynæcological Pathology," Fig. 33.)

Symptoms and Diagnosis.—Cancer, like papilloma of the tube, may lead to hydro-peritoneum. A sanguineous or sero-sanguineous discharge may also escape through the uterus. Otherwise the symptoms will resemble tubal inflammation. Cancer may be suspected if there is an aggravation of symptoms pointing to the tube, and an increasing lump in that situation after the age of forty-five, especially if there is fluid in the peritoneal cavity, or a sero-sanguineous discharge in gushes.

Treatment.—For a long time the growth appears to be confined within the limits of the tube and may be removed by abdominal section. Recurrence has taken place in a considerable proportion of cases recorded.

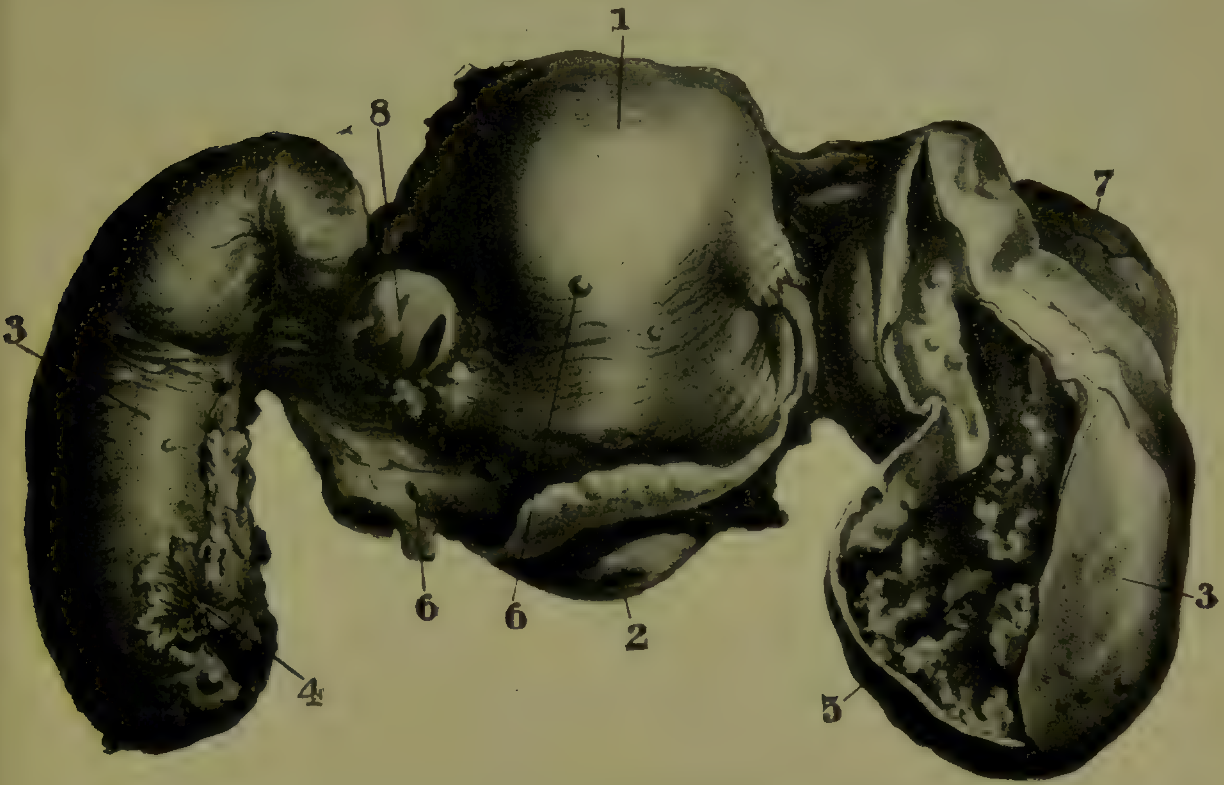

Fig. 258.—Tuberculosis of the Fallopian Tubes.

A uterus and Fallopian tubes; the latter are enlarged, and form two banana-shaped swellings which do not resemble the retort-shaped tumours usually seen in pyosalpinx. The tubes are closed at their fimbriated extremities. The right tube has been laid open; it is occupied by cheesy deposits, and in places is ulcerated and thickened. It contained pus. Here and there definite tubercles are seen on the peritoneal surface of the uterus and tubes. 1, fundus uteri; 2, cervix; 3, 3, the distended tubes (note the banana-like shape); 4, fimbriated extremity of the left tube; 5, right tube opened to show cheesy deposit in its interior; 6, 6, tubercles beneath the peritoneum; 7, enlarged ovary on the right side; 8, mass of breaking-down tubercular material. Transverse sections of the undilated uterine end of the tubes showed abundant infiltration of the mucous membrane with grey and caseous tubercle possessing well-defined giant-cell systems.

(After Hubert Roberts, "Outlines of Gynæcological Pathology," Fig. 30, and Targett, "Trans. Obstet. Soc. Lond.," vol. xli., 1899, p., 165.)

Secondary Cancer of the Fallopian Tube may occur, especially as the result of cancer of the ovary. In some cases the growth has penetrated the wall of a dilated tube, and led to a sanguineous discharge escaping through the uterus.

SARCOMA AND DECIDUOMA MALIGNUM of the Fallopian tube have both been recorded, the latter the sequel of tubal fœtation.

CYSTS may occur in or near the wall of the Fallopian tube, but are generally small and of no pathological importance (Fig. 238, p. 494).

TUBERCULOSIS OF THE FALLOPIAN TUBE is far commoner than tuberculosis elsewhere in the genital tract. This appears to indicate that the infection is usually a descending one derived from the peritoneum, rather than one conveyed through the vagina. In many cases the tubercle extends also to the endometrium. In most cases tuberculosis of the tube is secondary either to phthisis or general tuberculosis, or to tubercular peritonitis. In some instances, however, the tubercle is primary in the tube, so far as can be discovered. It may be that the bacilli reach in some way the peritoneal cavity, and are conveyed thence into the tube.

In the early stage the appearance is that of salpingitis, and only microscopic sections reveal that the inflammation is due to tubercle. Whitridge Williams estimates that 7 per cent. of cases of chronic salpingitis are tubercular.

In the more manifest stage the tuberculosis may have one of two forms—acute miliary tuberculosis, involving also surrounding parts; or diffuse chronic tuberculosis of the tube lining.

In some cases the tubercular character is obvious to the eye. The tube is generally only moderately dilated and filled with caseous material, and the lining membrane is ulcerated. The tube is generally bound by adhesions to surrounding parts, and tubercular nodules are scattered over the adjacent peritoneum. In others, the tube has the appearance of an ordinary pyosalpinx, and the tubercle is only discovered on microscopic section. Tubercular bacilli are often difficult to find, but the characteristic structure of tubercle, with its giant cells, is seen on section.

There is a special form of pyosalpinx which is generally found to be tubercular (Fig. 258, p. 553). The distension is considerable, and the tube banana-shaped rather than retort-shaped. It may be free, or nearly free, from adhesion; and thus this is a form of pyosalpinx which is liable to burst into the peritoneal cavity. The age of the patient in recorded cases has varied from five upwards, but the majority of cases occur between the ages of fourteen and twenty-five.

Symptoms and Diagnosis.—The symptoms may point merely to inflammation of the Fallopian tubes or pyosalpinx, or to general tuberculosis or tubercular peritonitis. In the former case the tubercle is discovered only at or after the operation for removal of the tubes. If evidence of tubal inflammation or of distended tubes is found in virgins, tubercle should always be suspected as the cause.

Treatment.—In the cases simulating inflammatory pyosalpinx, operation is generally indicated by the condition of the tube apart from its causation. If an abdominal incision is made, and tubercular peritonitis found, removal of the tubes is indicated only when they seem to be the primary source of the tuberculosis, and can be freed without too great risk from surrounding parts. Otherwise, the abdominal incision and evacuation of fluid, without drainage, is often found to have a beneficial effect on the tuberculosis.

TUBAL FŒTATION will not be discussed here, since it is included in works on Midwifery.

TUBO-OVARIAN CYSTS have already been described (*see* p. 491.) If the ovary is simply spread out and lost upon the wall of the dilated tube, the term "tubo-ovarian cyst" is not correctly applied.

CHAPTER XII.

DISEASES OF THE UTERINE LIGAMENTS AND OF THE ADJACENT PERITONEUM AND CELLULAR TISSUE.

INFLAMMATORY and other affections of the uterus and its appendages are apt to give rise to inflammation of the cellular tissue in the vicinity of these organs, especially in the broad ligaments of the uterus, where it exists most abundantly, and also to inflammation of the peritoneum covering the inflamed tissues. In the very acute and septic form of metro-peritonitis, inflammation extends to the whole peritoneum, and is often rapidly fatal; in the much more frequent cases, however, in which inflammation is less severe, it generally remains limited to the peritoneum of the pelvis and its vicinity. We have thus a pelvic or periuterine peritonitis and a pelvic or periuterine cellulitis. The terms of "*perimetritis*" to denote the former, and "*parametritis*" to denote the latter, have been introduced by Virchow and widely adopted. The former was suggested by the analogy of the word pericarditis, signifying inflammation of the serous covering of the heart, in contra-distinction to which Virchow proposed the terms paracarditis, paratyphlitis, paranephritis, and parametritis, to denote inflammation of cellular tissue near the heart, cæcum, kidney, and uterus respectively.

Neither pelvic peritonitis nor pelvic cellulitis often exists altogether independently of the other affection, for inflammation of the peritoneum extends more or less to the cellular tissue immediately beneath it. Inflammation of the Fallopian tubes often conveys infection to the peritoneum through the ostium of the tube, and also extends to adjacent cellular tissue. Again, the lymphatics bear an important part in all inflammation of cellular tissue, and these communicate freely with the peritoneal cavity. Not only, therefore, does cellulitis usually extend to the peritoneal covering of the part immediately affected, but, especially when of septic origin, it is apt to kindle a peritonitis which passes beyond that limit. The terms are, therefore, to be applied, not in an exclusive sense, but according as the affection of one or other structure is predominant.

Very diverse opinions have existed as to the relation and relative frequency of pelvic peritonitis and cellulitis. It was formerly assumed by many authorities that when a swelling was detected on vaginal examination the existence of cellulitis was established. It was proved, however, by Bernutz, from the evidence of numerous autopsies, not only that a localized swelling, tangible *per vaginam*, may be due to the effusion of lymph or serum and gluing together of intestines produced by peritonitis, but that this swelling may be situated at one side or in front of the uterus. Evidence derived from autopsy affords, however, no information as to the relative frequency of the two affections, since peritonitis is much more likely to prove fatal than cellulitis. Bernutz also went to an extreme in almost denying the occurrence of periuterine cellulitis, except in the form of phlegmon of the broad ligament. It is now, however, agreed by most authorities that, apart from parturition or abortion, or operations upon the cervix uteri, pelvic peritonitis is much more common than cellulitis, and that, in a large proportion of the cases which do not end in suppuration, inflammation of the peritoneum is the preponderating element. In many instances, however, the characters of the two affections are largely combined. The modern frequency of abdominal section in pelvic inflammation, and verification by this means of diagnosis made from physical signs, has led to much greater certainty than formerly existed as to the interpretation of those signs.

PELVIC PERITONITIS, OR PERIMETRITIS.

Causation.—Pelvic peritonitis may originate by contiguity from inflammation of the uterus, ovaries, or Fallopian tubes, or may be secondary to cellulitis. It may be the sequel of suppression of menstruation, due to the effect of cold, in which case the primary condition is an acute or subacute endometritis and metritis, of which the arrest of menstruation is the consequence, while the inflammation extends along the Fallopian tubes to the adjoining peritoneum. A more frequent cause of inflammation spreading from the uterus along the lining membrane of the tubes to the peritoneum is gonorrhœa, whose frequency as a cause amongst all non-puerperal cases of pelvic peritonitis has been estimated as high as 50 per cent. Thus prostitutes almost invariably suffer, at some time, from this disease, which generally renders them permanently sterile.

Next to gonorrhœa, septic endometritis, following parturition or abortion, appears to be the most common cause of a pelvic peritonitis which leaves a permanent adhesion of the Fallopian tubes as its sequel. Amongst other causes of pelvic peritonitis are replacement of the uterus by the sound, in some cases even the simple introduction of a sound which is not aseptic, the use of an intra-uterine stem pessary, applications to the interior of the uterus, and operations upon the body of the uterus. Peritonitis may also arise through septic absorption by the lymphatics, and thus may be the consequence of the use of tents, or operations upon the cervix or vagina; but, in this case, the inflammation is more likely to become general.

From menstrual disturbances pelvic peritonitis may result, not only through the medium of endometritis, but by direct reflux of blood through the Fallopian tubes, when the outlet of the uterus is obstructed in consequence of stenosis or flexion, especially if menorrhagia co-exists. In the same way intra-uterine injections may be an exciting cause. Escape of blood or other fluid, from any other cause, as from an early extra-uterine fœtation, from rupture of a vein, of an over-congested Graafian follicle, or of a cyst in the Fallopian tube or ovary, may equally set up peritonitis. External violence, cold, and sexual excess act mainly through the medium of the inflammation which they may produce in uterus or ovaries.

In puerperal cases the starting-point is usually an inflammation of the uterus or cellular tissue, due to a traumatic or septic cause, or a combination of the two. The peritonitis may, however, be kindled into activity by the effect of cold, of premature exertion, or of emotion. In other puerperal cases, again, the peritonitis is part of a general peritonitis, due to some septic, zymotic, or other form of blood-poison. Ovarian tumours frequently set up peritonitis; fibroid tumours do so less frequently; cancer or tubercle of the uterus or ovaries is sooner or later accompanied by such a result. A pelvic peritonitis may also be a part of a general peritonitis not originating near the uterus, and may then lead to the same results with respect to the pelvic viscera as the localized disease. Thus the signs of pelvic inflammation may attract attention in cases of tubercular or cancerous peritonitis.

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Pathological Anatomy.—In the active stage of inflammation, plastic lymph is poured out on the surface of the peritoneum, and leads to adhesion between the pelvic viscera. In acute cases there is also an effusion of serous, of sero-purulent, or, in the septic forms of peritonitis, of purulent fluid. In the majority of cases, however, the peritonitis is mainly or solely of the adhesive form. The semi-fluid lymph tends to gravitate into the pouch of Douglas, where it forms no tangible swelling so long as it remains fluid and free, but is generally converted into a firm mass, fixing the uterus, as the lymph consolidates. Within spaces formed by adhesion between coils of intestine, or between intestines and other viscera, serum may be poured out in considerable quantity, and a limited and rounded swelling may thus arise, which sometimes very closely simulates a true cyst (*see* p. 503). This constitutes encysted perimetritis.

Suppuration may also take place in similarly limited spaces, though much less commonly than in the case of cellulitis. The pus thus collected may remain quiescent for a considerable time, and rarely escapes into the general peritoneal cavity. As a rule the abscess perforates sooner or later, opening in most cases into the rectum or sigmoid flexure. Perforation into the vagina is less common, and that into the bladder still more rare. Perforation on the external surface is also comparatively uncommon. When it does occur the most frequent site is the neighbourhood of the umbilicus. Sometimes the abscess opens at more points than one.

In some instances, especially after labour, but much more rarely than in the cases of pelvic cellulitis, the inflammation may subside near the uterus, but at some more or less distant point go on to the formation of serum or pus, or the production of an important tumour by agglutination of intestines. This condition Dr. Matthews Duncan described by the name of "remote perimetritis." In the later stage of the more common affection, or adhesive peritonitis, the lymph becomes organized into bands of adhesion. As time goes on, after subsidence of the inflammation, these are generally partially absorbed, and become lengthened and attenuated, especially in those situations where most motion naturally takes place. Some degree of distortion and fixation of the parts involved is, however, generally permanent in some situations, especially about the Fallopian tubes and ovaries; hence sterility is a common sequel. The common effect of occlusion of the fimbriated extremity of the

Fallopian tube has already been described. The Fallopian tube which was the source of the disease often remains permanently in a morbid condition, either thickened, with an inflamed or hypertrophied lining membrane, or less frequently distended into a hydrosalpinx, pyosalpinx, or hæmatosalpinx. The uterus is apt to be fixed, temporarily or permanently, in any abnormal position it may have had at the outset of the inflammation, and it is also liable to distortion gradually produced by traction, in consequence of the shrinking of plastic lymph.

Results and Symptoms.—In the more acute forms of pelvic peritonitis, the symptoms resemble those of general peritonitis, and differ only in the fact that the pain and tenderness are more or less localized in the lower part of the abdomen, and that the general symptoms are less intense in degree. Frequently there is a rigor at the commencement, and pain may be severe at first, accompanied by extreme tenderness in the hypogastrium. The pulse becomes rapid, and acquires more or less of the peritonitic quality. There is often a considerable rise of temperature, but its elevation is generally less in proportion than that of the pulse, and sometimes even a normal temperature exists in severe septic forms of inflammation, so that the temperature alone is an unsafe guide as to severity. Frequent micturition, with severe vesical tenesmus, is a common symptom. The bowels are usually constipated (except in septic forms of general peritonitis), and there is much pain on defæcation. The abdomen is frequently tympanitic, and it is not uncommon to find a transient tenderness over its whole surface, which may shortly subside, and leave only localized symptoms. Rigidity of the abdominal muscles over the region of tenderness is almost invariably present. In the more severe forms of inflammation, nausea and vomiting are common, and the features become pinched and anxious.

Cases of adhesive peritonitis, however, are not unfrequent in which the inflammation is chronic and almost latent from the first, especially when the exciting cause is some continuous, but not very intense, source of irritation, such as endometritis or ovaritis, or when the attack is a recurrence of some old-standing inflammation. This may happen even in the gonorrhœal form of the disease, although, under such circumstances, the attack is commonly more acute. In the chronic cases the symptoms are extremely insidious, and the patients may go about their occupations as usual, suffering only from a gradually increasing pain in hypogastric or inguinal regions. In some instances the only complaint made is that of bladder irritation, although, on examination, the whole pelvis is found to be filled with inflammatory induration. The pulse in these cases is usually found to be rapid, often from 100 to 120, although elevation of temperature may be slight or absent.

The sequelæ of the disease are of an extremely chronic kind, and those who have once suffered from it are generally liable to relapse on slight provocation, especially from the effect of cold, or imprudence at menstrual periods. In many cases the uterus eventually recovers its mobility, and almost all remnant of swelling in the pelvis disappears. When, however, the whole roof of the pelvis has become hardened into a board-like mass, and no sign of commencing absorption appears within the first few months, this condition may remain a permanent one. More frequently a swelling permanently remains posteriorly on one or both sides, consisting of tube and ovary matted together by inflammation, with or without distension of the tube by serum or pus. Years may elapse before the utmost degree of relative cure which can be hoped for is attained, and patients may remain invalids for, at any rate, the remainder of the period of active sexual life.

After an attack of peritonitis, the recurrence of menstruation is frequently deferred. The ensuing period is apt to rekindle inflammation, but, if this does not happen, it is often followed by relief. Protracted or even permanent amenorrhœa, or scanty menstruation, is, however, a frequent sequel. Dysmenorrhœa is also commonly produced from the interference with the functions and vascular supply of uterus, tubes, and ovaries caused by the adhesions.

Diagnosis.—In the more acute forms of the affection the symptoms readily show the existence of peri-uterine inflammation, and the chief point of difficulty is to determine whether peritonitis or cellulitis is the main element. Assistance may be derived from the consideration that, when there has been no antecedent parturition, abortion, or operation on the cervix, and when the exciting cause lies in the body of the uterus, ovaries, or Fallopian tubes, rather than in the cervix, especially if that cause be gonorrhœa, the inflammation is more likely to be peritonitic. In peritonitis, also, tenderness is more acute, and vomiting and other symptoms pertaining to the digestive functions are more likely to be prominent than in cellulitis, with little or no complication of peritonitis. In cellulitis, on the other hand, the initial rigor and elevation of temperature are more marked in proportion to the other symptoms. In cellulitis, the patient may lie with one leg flexed; in peritonitis, both legs will be flexed if the inflammation is severe.

On vaginal examination in the earliest stage, while the exudation is still fluid, merely tenderness and slight increase of resistance will be discovered around the cervix. The uterus will be very tender on pressure, and still more so on displacement. After consolidation of the exudation, one of two conditions may be found:—

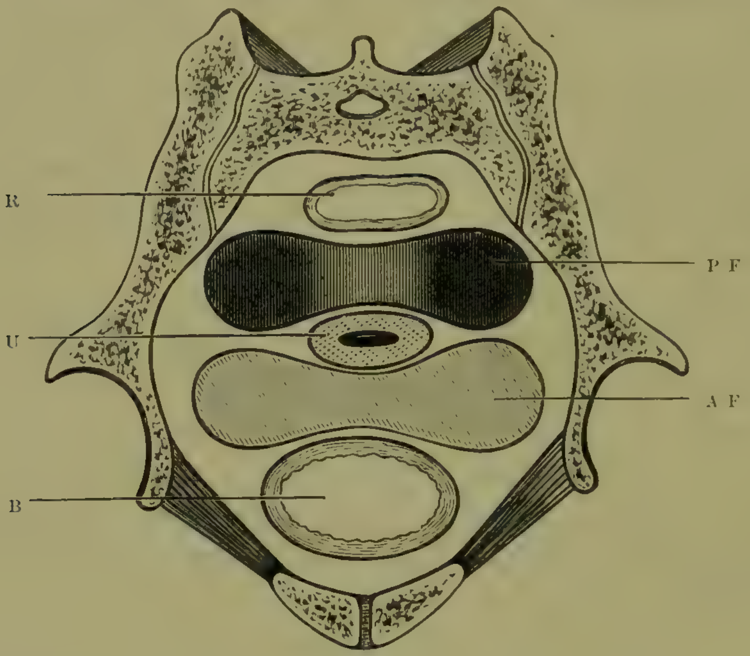

Fig. 259.—Section parallel to pelvic brim, a little above the level of the internal os uteri, showing the situation of induration in Perimetritis.

B, bladder; U, uterus; R, rectum; A F, anterior fossa of peritoneum, slightly indurated by effusion of lymph; P F, posterior fossa of peritoneum, more considerably indurated by effusion of lymph, especially at the sides where the Fallopian tubes lie.

(1) In the first, the inflammation, while limited to the pelvis, is general throughout that region. This constitutes the most typically recognizable form of pelvic peritonitis. The cervix uteri is then central, or slightly pushed forward, low down in the pelvis, and firmly fixed, not displaced to either side. Induration extends all round it, and forms a complete roof to the pelvis, of uniform hardness, feeling as if plaster of Paris had been poured into the pelvis, around the

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uterus. At the posterior part, where lymph gravitates into the pouch of Douglas, it descends somewhat lower, and forms a more distinct mass (P F, Fig. 259). The recognition of the lower margin of this, on rectal examination, as a transverse ridge, at about the level of the external os, is very characteristic. The posterior vaginal fornix is thus depressed. The lateral fornices may also be depressed, but in less degree.

Frequently the ovary and tube on one or both sides can be recognized as forming a focus of inflammation, felt as a lump in one or both posterior quarters of the pelvis, behind the plane of the broad ligaments. The induration can be reached from above the pelvic brim, but does not form an apparent tumour rising into the abdomen, or extending into the iliac fossa, nor does it descend so low upon the vaginal walls as that formed by cellulitis sometimes does. On rectal examination, the transverse ridge already mentioned, corresponding to the pouch of Douglas, can be felt, but the upper limit of the induration can scarcely be reached. If there is accompanying parametritis, the induration may extend at the sides of the rectum to the pelvic wall.

(2) The second, but much rarer, condition is that of encysted perimetritis, which may extend or not above the pelvic brim. Serum or pus is poured out into a space surrounded by adherent intestines, and a cystic tumour may thus be simulated. If the adherent intestines contain impacted fæces, the tumour may appear to have solid portions, and the same impression may be given by indurated lymph felt *per vaginam* at its base. The commonest situation for encysted peritonitis is behind the uterus. The uterus is then pushed forward and upward, and a swelling may be formed which can be felt above the pelvic brim lying behind the fundus uteri. The physical signs are then very similar to those of retro-uterine hæmatocele. If the swelling does not descend into the pouch of Douglas, or push the uterus forward, but is situated elsewhere, the resemblance may be rather to an ovarian cyst complicated by inflammation. The swelling due to encysted perimetritis may generally be distinguished by its fixity, and by the history of its first appearance after the onset of acute inflammatory symptoms. It may rise as high as the umbilicus, and is often nearly central, while the swelling produced by parametritis is generally on one side, tending toward the iliac fossa, and rarely rises more than two or three inches above Poupart's ligament.

A surface of lymph which originally formed a union between two adjacent viscera, such as intestine, may gradually become stretched by pressure, while at the same time it becomes organized, and grows thicker by accretions of lymph. It may thus form in time a kind of false cyst-wall, which, when the abdomen is opened, may at first give rise to the impression that a true cyst is present. It has sometimes even been found strong enough to stitch to the abdominal wall.

Other varieties of plastic perimetritis occur, in which the uterus is not symmetrically situated, but the inflammatory mass is more on one side, and the uterus is consequently pushed in the other direction. This is especially the case when the perimetritis is associated with a distended tube or a small ovarian cystoma. Such a form of perimetritis is distinguished from parametritis by the fact that the main lump is not in the broad ligament but generally behind it, and does not extend to the pelvic wall as in parametritis.

A peritonitis affecting the pelvis, which constitutes a part of cancerous or tubercular peritonitis, or originates in perityphlitis, is distinguished by recognition of the signs of the primary disease. An induration produced by diffused cancer of the pelvis may closely resemble that of pelvic peritonitis, and may be only distinguishable by the amount of cachexia present, and by the course of the case, especially by the absence of inflammatory symptoms at the outset, and a downward course afterwards. The diagnosis may be assisted by the age of the patient, and sometimes by the detection of nodular masses like enlarged and indurated glands, or outlying portions of growth, to be detected especially on rectal examination. These may be in the pouch of Douglas, or may extend into the cellular tissue of the utero-sacral ligaments, in which case they are still more significant of cancer. The discovery of the slight increase of resistance or diminution of mobility of the uterus, which may be the sole remnant of a bygone pelvic peritonitis, often requires a highly practised touch.

Treatment.—The treatment is similar to that of peritonitis in general. Not only should complete rest in bed be enforced from the first, but it should be maintained for a considerable time, until the patient has, for a week at least, had a normal temperature and been free from pain. Generally, several weeks in bed will be required in all, and sometimes longer.

In acute cases, subcutaneous injections of morphia or the administration of opium will be required for the relief of pain at first. Care should be taken that fæcal accumulation is not thus produced; and the opiate should be reduced and discontinued as soon as possible. A daily evacuation of the bowels should be secured by enemata in the acute stage. A little later, saline laxatives should be given, and these often relieve pain by depleting the portal system, and diminish the necessity for opiates.

Authorities differ widely as to the relative advantages of hot and cold applications. Some, especially American authorities, apply cold in the form of an iced-water coil to the abdomen, with the idea of reducing inflammation. It is doubtful, however, whether the temperature in the pelvis can be reduced as the temperature of a joint is reduced by cold applications. Hot applications are more comfortable to the patient, and hot fomentations can be combined with the local applications of opium and belladonna. After the early stage, counter-irritation is more effective in reducing both pain and inflammation.

Opinions differ widely as to the use of mercury. It appears to be of little value as an antiphlogistic in the early stages, but in severe prolonged cases, not of a septic or purulent character, it may be tried if the disease appears not to yield to other remedies, care being taken to keep short of salivation, and not to act upon the bowels. The plan adopted by some is to give three grains of hydrargyrum cum cretâ with five grains of Dover's powder, in pill or powder, two or three times a day. It is generally preferable, however, to use the mercury locally, in the form of ointment, equal parts of mercurial ointment and belladonna ointment being applied on lint over the seat of inflammation. Milk and beef-tea may be given as diet, ice being added to the former if vomiting is urgent. Vomiting is often relieved in these cases by subcutaneous injection of morphia. The treatment of severe septic forms of inflammation has been considered under the head of Metritis (*see* p. 181).

In less acute forms of pelvic peritonitis, opium or morphia in smaller doses may be given at first in combination with salines, as citrate and nitrate of potash, or acetate of ammonia. In the later stage, iodide of potassium, in doses of from five to ten grains, is useful as an absorbent, and may often with advantage be combined with quinine or other tonic. After all febrile symptoms have passed, absorption is not promoted so effectually by the administration of any drug as by securing the best possible condition of general health, and by all ordinary means which tend to promote the activity of processes of nutrition. Small doses of perchloride of mercury may, however, in some cases, be tried (*see* formula, p. 242), since this drug appears to be much more effective as an absorbent, in removing inflammatory products, than as an antiphlogistic during the acute stage of inflammation.

As the inflammation is subsiding, repeated counter-irritation is of great value. Vesication by blistering fluid, over a surface about four inches square, may be repeated at intervals of about ten days, or a blister may be kept open by savine ointment. A milder remedy is the liquor iodi fortis, painted daily over the same surface as long as the skin will tolerate it. If the absorbent effect of iodine, without counter-irritation, is desired, iodine vasogen, 6 per cent., may be rubbed daily into the skin. Absorption is also stimulated by hot vaginal injections or irrigations, used in the manner previously described (*see* p. 204). The heat should be moderate at first, and should be increased gradually up to about 115° F. Hot hip-baths, or, still better, whole-baths, are also of value, and are efficacious to relieve pain. When the absorption of inflammatory material does not proceed satisfactorily, the use of salt water often proves efficacious, from its greater stimulating power.

When a case has reached the chronic stage, or is chronic from the commencement, complete confinement to bed is not advisable. Sufficient air and exercise to maintain the general health should be allowed, especially carriage exercise, if the motion can be borne without pain. A large amount of rest, however, should be taken in the horizontal position, and cold or exertion should be specially avoided at menstrual periods. Marital intercourse is to be forbidden in acute stages, or while it produces pain, and should be greatly restricted for a long period. It is not, however, always desirable to prohibit it entirely, especially if there is any ovarian engorgement or inflammation, such as often results from the hindrance to the function of the ovary produced by adhesions. Recurrent pain, accompanied by tenderness of the uterus, may be relieved by hot water irrigations, or by local depletion of the cervix by punctures or glycerine tampons. At this stage, tonic treatment, especially the administration of iron and quinine, is beneficial, and change of air, or a seaside residence, often proves useful. If relapses are found to occur from the effect of cold, spending the winter in a warm climate is to be recommended. Iodine or bromine waters, such as those of Kreuznach, Woodhall Spa, or Salso Maggiore, are often found efficacious in promoting absorption. Treatment by baths and douches at other spas, such as Bath, Franzensbad, Ems, or Marienbad, is also often of value.

Operative treatment is rarely called for in a first attack of acute perimetritis. Even if a pyosalpinx is diagnosed, the operation will be less risky if performed in the quiescent stage, and it is possible that the pus may gradually escape through the uterus, and a relative cure be attained without operation. The formation of an acute abscess is an indication for operation, and the treatment of it has been discussed under the head of Pyosalpinx (p. 543). Operation may also be required if a pyosalpinx increases to a very large size, or if pyrexia and other symptoms of suppuration fail to subside within a reasonable time. This is more likely to occur if the infection is septic than if it is due to gonorrhœa. If operation is necessary while acute septic symptoms exist, it will be less dangerous if it can be performed by the vagina rather than by the abdomen, unless a large tumour is present. More often an operation is only called for if recurrent attacks of pain and pyrexia occur, and a chronic pus focus in tube or ovary is diagnosed as a cause of them.

The treatment of an abscess forming a swelling behind the cervix has already been described (*see* p. 543). If an abscess is pointing externally it should be opened antiseptically, and a drainage tube inserted according to Lister's method, the end of the tube being cut off level with the skin, and secured by two loops of silkworm gut passed through the end of the tube, and laid flat upon the skin beneath the gauze dressings. If an abscess has spontaneously opened externally, or has been opened without antiseptic precautions, and pus continues to be poured out from an extensive cavity, a large drainage tube should be inserted to the full depth of the cavity. The end of the drainage tube may be immersed in carbolic lotion, and the cavity may be washed out by means of a funnel with chinosol, 1 in 400, a weak solution of iodine (tr. iodi ʒj. ad aq. Oj.), or sulphurous acid (acidi sulphurosi ʒij. ad aq. Oj.), Antiseptic dressings may be used, although it is difficult to render aseptic a large and irregular cavity. Carefully adjusted pressure by pads of cotton-wool may assist in causing the cavity to close. If the abscess cavity is found to descend close to the vagina, it may in some cases be desirable to make a counter-opening at its lowest point by cutting from the vagina upon the point of a probe passed into the abscess. This should not, however, be done until the plan of using a large drainage tube and antiseptic irrigation has had a full trial. If these means of closing the abscess cavity fail, removal of the uterus by vaginal hysterectomy is the most effective resource.

In encysted serous perimetritis it is generally better to leave the serum to be absorbed spontaneously. Sometimes, however, the constitutional symptoms produced are very marked, and may simulate those of abscess. Serous perimetritis, situated in the pelvis behind the uterus, is most likely to call for interference on account of pressure symptoms and constitutional disturbance. It will generally be impossible under these circumstances to be absolutely certain beforehand whether the fluid is serum or pus. Aspiration may be employed in the first instance, with very careful antiseptic precautions. If the fluid proves to be serum it may be simply evacuated. If it re-collects, or symptoms of infection arise, the cavity should be opened and drained, as described for the case of abscess. The fluid being still only serous, it may be drained from the first by packing the cavity with moist iodoform gauze, 10 per cent. If it is becoming purulent a drainage tube should be used at first. The gauze should be changed at intervals of two or three days; and the cavity may be washed out with a non-poisonous antiseptic.

Serous perimetritis in the abdomen less often requires opening, unless it is tubercular, since it is not so likely to cause pressure symptoms. It may, however, be found when an exploratory abdominal incision is made in a case of doubtful diagnosis, or it may be mistaken for a cyst. If the cavity is a limited one with thickened walls, it is generally advisable to drain it with iodoform gauze, either by the abdomen, or by the vagina, if the cavity extends close enough to the vagina. If there is a thick wall, forming a pseudo-cyst, the wall should be stitched to the abdominal incision, if possible, so as to shut off the general peritoneal cavity.

If the effusion is thought likely to be due to tubercle, an abdominal incision should be made, and the fluid evacuated without drainage, if the diagnosis of tubercle is verified. This proceeding has often led to the cure of the tubercular peritonitis. The reason is not known, but it may be due to the fact that the evacuation of the fluid allows the serous surfaces to come in contact and adhere.

The chronic effects of pelvic peritonitis, consisting of adhesions around the Fallopian tubes and ovaries, and, in some cases, distension of the Fallopian tubes by serum or pus, may call for operative treatment at a later date. The operation has already been discussed and described under the head of Diseases of the Fallopian Tubes. Simple matting of the tubes by adhesion is commoner as a sequel of pelvic peritonitis than distension of the tube, and, unless the distension is considerable, it is not always possible to ascertain, without an exploratory operation, whether there is distension or only adhesion. Even when there is no distension, the operation for removal of the uterine appendages is justified in some cases. If, however, there is very general and firm adhesion of uterus and intestines, indicated by a firm induration of the whole of the pelvic roof, felt on vaginal examination, it may be difficult or impossible, even for an experienced operator, to separate and remove the tubes and ovaries. For the pelvis may be found covered in with adherent intestines, so that even the uterus cannot, without great difficulty, be reached as a guide. In such cases, vaginal hysterectomy may be the best resource.

The operation of salpingo-oophorectomy should not be performed on account of the effects of a single and recent attack of pelvic peritonitis, for a great if not an absolute degree of cure may be attained spontaneously in course of time. It is chiefly indicated in cases in which a patient has been an invalid for years, or suffers repeatedly from recurrent attacks of pelvic peritonitis, in which the symptoms are distinctly aggravated by menstruation, and in which a lump, more or less fixed, can be felt in the situation of tube or ovary. It is to be remembered that the intestinal and other adhesions resulting from pelvic peritonitis may be a source of considerable pain, especially in neurotic subjects, even after the removal of tubes and ovaries. A neurotic subject has been known, after removal of the uterine appendages, to complain of pain as bad as before in the ovarian region, although there was no adhesion nor septic infection of ligatures.

PELVIC CELLULITIS, PERI-UTERINE CELLULITIS, OR PARAMETRITIS, WITH PELVIC LYMPHANGITIS.

Causation.—The chief causes of pelvic cellulitis are parturition, abortion, applications of caustic to, or operations on, the cervix uteri or vagina, ulceration of the vagina as from the use of pessaries, inflammation of the uterus, especially the cervix uteri, and inflammation of the ovaries or Fallopian tubes. In a very large proportion of cases the cause is parturition, and the mode of origin may then be, in whole or in part, directly traumatic, from the pressure and bruising to which the cervix and cellular tissue are exposed, or from lacerations of the cervix. Thus, puerperal cellulitis is much more common on the left side, on account of the usual direction of the occiput toward the left and the common deviation of the fundus uteri toward the right, both which causes tend to make the pressure greater on the left side of the pelvis.

In the majority, however, both of puerperal and non-puerperal cases, the main element is septic absorption from some cut or lacerated surface, or from an abrasion, such as may be produced by the use of tents. Not only the loss of epithelium, but the injury to the tissues predisposes to septic absorption. For the damaged tissue, having its vitality lowered, does not, like healthy tissue, resist the entry and multiplication within it, even of organisms which may be generally or frequently present in the lochial or vaginal discharge. Thus an inflammation set up mechanically by very difficult instrumental delivery often acquires a more or less septic character, apart from any specially conveyed contagion. The determining cause of the acute outbreak of inflammation may be the effect of cold, mental emotion, or premature exertion after parturition, or after some operative interference.

Parametritis may result without any traumatic origin, but much less frequently than perimetritis; and, when it does so, it is probably for the most part by extension of inflammation from the ovaries or Fallopian tubes into the adjoining tissue; and the parametritis is only an accompaniment of the perimetritis, which is the predominant lesion. Parametritis may also be the sequel of hæmorrhage into the cellular tissue, the result of traumatic causes, or extra-uterine fœtation. A similar inflammation of cellular tissue may take its origin from cancerous or syphilitic ulceration of rectum or vagina, or from disease of the bladder.

Pathological Anatomy.—Parametritis is an inflammation or phlegmon of the areolar tissue in the pelvis, in the vicinity of the uterus or its appendages. This areolar tissue is most abundant in the broad ligaments. It also exists in plenty in front of the lower half of the uterus between it and the bladder, for a smaller space at the posterior part of the cervix (*see* Fig. 2, p. 5), as well as around the vagina, bladder, and rectum, and in the sheaths of the psoas and iliacus muscles and the muscles of the abdominal wall. Between the uterus and its peritoneal covering at front and back, areolar tissue is so scanty that cellulitis can scarcely occur there. The term "peri-uterine cellulitis" has been used in a sense limited to inflammation immediately adjoining the uterus at its sides, front, or back. An abscess after parturition, however, may appear at a distance from the uterus, as in the groin or abdominal wall, while no remnant of inflammation can be detected round the uterus, and the wider term of "pelvic cellulitis" or "parametritis" therefore appears preferable. Those cases, however, are to be distinguished in which inflammation merely extends into the pelvis from outside, as in a psoas abscess.

In the majority of cases, especially those of puerperal origin, the inflammation is chiefly situated in one or the other broad ligament, whence it tends to spread into the iliac fossa, and along the sheaths of the muscles to the groin and the adjoining portions of the abdominal wall, the peritoneum being stripped up from the psoas and iliacus muscles by the inflammatory products. This form of parametritis has been distinguished by the name of "*phlegmon of the broad ligament.*" In other cases, however, especially those arising from lesion of the cervix, the tissue in front of, or behind, the uterus may be chiefly or solely affected, and the inflammation may also descend along the walls of the vagina or rectum, or may occupy chiefly the tissue at the base of the bladder.

Since septic absorption is so generally an element in cellulitis, the lymphatic vessels play an important part in it, as in all inflammations of cellular tissue. In some cases, enlarged lymphatic glands in the pelvis may be detected as rounded masses in the midst of inflammatory thickening, and these may form foci of inflammation or abscess formation.

In the earlier stages of parametritis a swelling is produced by effusion, first, of serum, and, secondly, of lymph in addition to serum, into the areolar tissue. This may end in resolution, or in the formation of an abscess, which is a much more frequent result than in peritonitis. It is commonest in puerperal cases, and has been estimated by some authorities as occurring in more than 50 per cent. of these; but this is probably too high an average, if mild as well as severe cases are included. By far the most frequent spot for the abscess to open is the groin or iliac region, most frequently above Poupart's ligament, the pus generally making its way mechanically along the course of the psoas and iliacus muscles. It may also open externally above the pubes, beside the anus, or, very rarely, pass through the sciatic or obturator foramen. Internally, discharge into the rectum and that into the vagina are about equally common; that into the bladder is also frequent, but rather less so. Discharge into the peritoneal cavity is fortunately very rare. Internal evacuation is commoner in non-puerperal cases, in which the abscess is generally nearer to the uterus, or, in rare instances, may be situated between uterus and bladder.

The following are other varieties of parametritis less common than the ordinary:—

Remote Parametritis.—When an abscess resulting from parturition appears at a distance from the uterus, as in the inguinal canal, in the sheaths of the abdominal muscles, or near the sacro-iliac joint, and the vicinity of the uterus is found free, the explanation is, probably, for the most part, that the inflammation has terminated in resolution near the uterus, and has proceeded to suppuration at a distant point only. In some cases, however, the distant abscess may be due to conveyance of septic material by lymphatics, without any perceptible intermediate inflammation. To this manifestation of inflammation at a distant point, which is not extremely uncommon, Matthews Duncan has given the name of "remote parametritis."

Bilateral Parametritis.—This may result after parturition from absorption at lacerations on both sides of the cervix, but it is more frequently due to tubal inflammation on both sides with perimetritis. The inflammation not only extends through the ostium to the peritoneum, but through the walls of the tube to the cellular tissue. The uterus is central or nearly so, and the swelling occupies both broad ligaments.

Posterior Parametritis.—This form is also generally secondary to tubal inflammation. It involves especially the tissue around the utero-sacral ligaments, and leads eventually to contraction of these, dragging of the centre of the uterus backwards, and sometimes anteflexion of the uterus in consequence. While the exudation is present it may be felt from the rectum as a horizontal shelf running backward on one or both sides to the pelvic wall. Induration in this position often persists as long as a focus of inflammation remains in the Fallopian tube.

Anterior Parametritis.—In this form the inflammation extends from the anterior parts of the broad ligaments to the cellular tissue surrounding the bladder and lying behind the pubes. A swelling may be formed rising two or three inches above the pubes, and extending all across the hypogastrium. If suppuration occurs the abscess generally opens externally above the pubes, or into the bladder.

Results and Symptoms.—The onset of the disease is acute in the great majority of cases, and a decided rigor and elevation of temperature (often reaching or exceeding 103° or 104°) more generally occur than in the case of pelvic peritonitis. The fever is accompanied or quickly followed by pain, which is not always very acute, and often depends in great measure upon implication of the peritoneum. Vesical tenesmus and pain on defæcation are frequently added. If menstruation is present at the time of onset, the flow may be increased, except in cases in which the inflammation is complicated by any considerable degree of acute endometritis or metritis, the effect of which is usually to arrest either the lochial or the menstrual discharge.

In some puerperal cases the inflammation commences more gradually, and is only kindled into activity after the patient leaves her bed. More rarely the symptoms are limited to slight pelvic pain, and trouble in micturition, with feverishness and debility, and the exudation may only be discovered on examination at a considerable interval after delivery. More frequently a swelling appears within a few days in the groin or iliac region, or extending to the hypogastrium. Flexion and abduction of the thigh, which are often enforced in consequence of the pressure of the exudation, are characteristic symptoms. In the course of a few weeks, in the majority of cases, the disease either ends in suppuration, or resolution has commenced. Thickening in the cellular tissue, however, is only slowly absorbed, and a certain amount of induration may be permanent. Lameness on the affected side is often slow in disappearing. The uterus is generally drawn to the affected side by contraction of the inflamed tissue in a late stage; but complete fixation of the uterus, with sterility, and other permanent sequelæ, when they occur, are commonly due to associated peritonitis. After a long interval the only relic is often a thin band of induration running from the angle of a lacerated cervix to the pelvic wall, and drawing the uterus very slightly to the affected side. This is frequently noticed when no symptoms acute enough to lead to a diagnosis of parametritis have ever occurred. Suppuration probably most frequently commences within a few days, when it takes place at all, but the period of bursting of the abscess commonly varies from two weeks to three months.

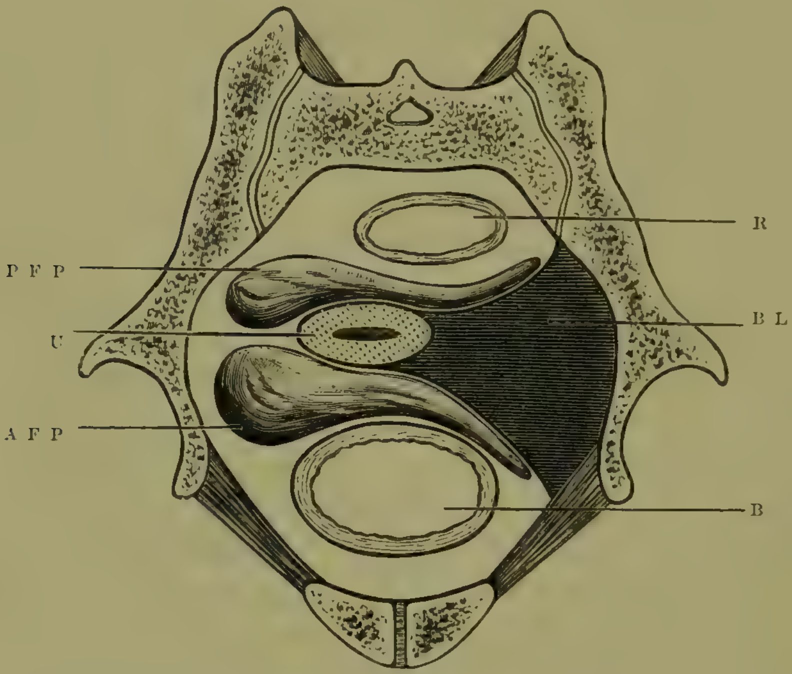

Fig. 260.—Section parallel to pelvic brim, a little above the level of the internal os uteri, showing the situation of induration in Parametritis.

B, bladder; A F P, anterior fossa of peritoneum, free from exudation; P F P, posterior fossa of peritoneum, free from exudation; U, uterus displaced to right; B L, left broad ligament infiltrated with cellulitic effusion; R, rectum.

Thrombosis of the veins is a common result of inflammation in the cellular tissue surrounding them, and involves a risk of pulmonary embolism. This is one reason why protracted rest should be enforced after even a slight attack of parametritis. If thrombosis extends to the iliac or femoral veins and lymphatics, phlegmasia dolens may be a sequel, especially in puerperal, but sometimes also in non-puerperal, cases. In some instances an abscess burrows extensively in the pelvic cellular tissue. Suppuration may then be protracted, especially if the abscess opens by a long fistulous track, or an opening exists in two directions simultaneously. The patient may thus be greatly reduced by hectic fever, and even a fatal result follow. In very rare cases there is extensive sloughing of areolar tissue. From such a cause fatal hæmorrhage into the abscess cavity has sometimes occurred. The mortality, however, of uncomplicated pelvic cellulitis is in general small, and much less than that of pelvic peritonitis.

Diagnosis. — In the typical form of parametritis, namely, that of phlegmon of the broad ligament, in which the cellular tissue of the broad ligament is the chief focus of inflammation, the diagnosis is generally easy. On vaginal examination, a considerable and immovable swelling, shading off into the pelvic wall, is felt on one side of the cervix, and rather low down. The cervix itself is pushed toward the opposite side, and its mobility, although diminished, is often not entirely destroyed. Some thickening may also extend round the front and back of the uterus, but, in general, one lateral vaginal fornix only is depressed. The lateral swelling can be reached by the external hand above the groin, and on bimanual examination is felt as a considerable mass between the fingers. The thigh on the affected side is frequently retracted. Unless the extent of inflammation is very limited, it forms a swelling in the inguinal and iliac region either prominent and readily tangible, or, at any rate, sufficient to give rise to a feeling of resistance, and partial or complete dulness on percussion. A cellulitic swelling, however, rarely extends higher than two or three inches above Poupart's ligament, or is liable to be mistaken for a tumour, except in the rare case of a large abscess between uterus and bladder, which may rise as high as half-way between pubes and umbilicus. For the differential diagnosis of a swelling in the abdomen due to peritonitis, *see* p. 561. The symptom of retraction of the thigh, with pain upon any attempt to extend it, may persist for a long time after delivery, and may be the only local sign to indicate the presence of inflammation or abscess about the psoas and iliacus muscles, when no swelling can be detected.

The swelling is somewhat wedge-shaped, with the broad end outward, reaching to the pelvic wall, and corresponding to the shape of the broad ligament (Fig. 260). At the height of the exudation it is convex in all directions. As absorption is commencing it may become flattened, or angular, or even concave, as felt from the vagina.

If an examination is made months or years after, when absorption has taken place, the uterus will probably be found somewhat drawn toward the affected side, and often a thin cicatricial band will be felt, running to the pelvic wall, and starting from the angle of the laceration, which was the starting-point of inflammation.

The special characters of bilateral, posterior, and anterior parametritis have been already mentioned.

From a fibroid or ovarian tumour, a cellulitic swelling is distinguished by its fixity, and by the fact that no sign of tumour had existed before the onset of inflammatory symptoms. For the differential diagnosis of extra-uterine fœtation, *see* pp. 504, 506; and for that of hæmatocele, *see* p. 584.

Treatment.—The local and general treatment is similar to that of pelvic peritonitis (*see* p. 564). From the frequent presence of a septic element, quinine, or other internal antiseptic, in full doses, combined with opiates, is often given with advantage until the temperature is reduced.

For opening an abscess it is not necessary to wait until there is reddening of the skin or distinct pointing, but only until it is clear in what direction the abscess is tending, and there is sufficient swelling and induration to make it clear that the peritoneum will not be opened. Delay beyond this point only allows the abscess to burrow more extensively. The most usual spot is about an inch or an inch and a half above the centre of Poupart's ligament. The presence of pus should first be verified by the hypodermic syringe or aspirator. Then an incision is made through the skin, the abscess is opened, according to Hilton's method, by director and dressing-forceps, the finger is passed in to make sure that the opening is free, a good-sized drainage tube is introduced, and antiseptic dressings are applied.

When the pointing takes place by vagina or rectum, artificial evacuation requires more caution, and is more frequently superfluous. If a distinctly fluctuating spot is felt from the vagina, aspiration may first be employed, and a larger opening made if pus is found. The incision should be made in the manner already described for the case of a peritonitic abscess (*see* p. 543). If the abscess fails to close for a long period, and a large abscess-cavity is found to exist, it should be treated by the use of a large drainage tube, antiseptic irrigation, and pressure as already described; or, in exceptional cases, a second opening may be made at the most dependent point.

Some authorities have recommended puncture by an aspirator or small trocar, as soon as the formation of pus is suspected. Such a puncture, however, rarely evacuates the whole of the pus, or averts the further formation of pus, and subsequent discharge. In general it appears to be better to wait until the puncture can be immediately followed up by making a free opening.

Lawson Tait and others have treated some cases of pelvic abscess by abdominal section, opening the abscess from above, free washing out, stitching the opening in the abscess to the abdominal wound, and placing a glass drainage tube in its cavity. For such treatment, the abscess should extend above the brim, so that it may be possible to bring the opening in it into contact with the parietal peritoneum. Only an operator experienced in abdominal surgery should venture on this proceeding.

In general, if, when the peritoneal cavity is opened, a swelling is found which is diagnosed as a cellulitic abscess, it is preferable to use one hand in the peritoneal cavity as a guide for opening the abscess from the vagina, or from some external surface from which it can be reached extra-peritoneally.

PELVIC HÆMATOCELE.

By pelvic or peri-uterine hæmatocele, in its wider sense, is understood a limited collection of blood wholly or partially in the pelvis, and contained within the peritoneal cavity. An effusion of blood while still free within the peritoneum should not receive the name of hæmatocele, though its causes may be the same, and though it may form an antecedent stage to that affection. The term hæmatocele was formerly extended also to an effusion of blood into the cellular tissue, but the name of *pelvic hæmatoma* is now commonly applied to this.

Causation.—As regards the *immediate mechanism* of hæmatocele the following causes have been assigned—(1) Reflux of menstrual blood through the Fallopian tubes, or menstrual bleeding from the tubes, due either to atresia or obstruction of the cervix or vagina, to a morbid condition of the tubes themselves, or to excessive menstruation; (2) excessive hæmorrhage on rupture of a Graafian follicle; (3) rupture of a vessel in the broad ligament or elsewhere; (4) hæmorrhage from inflamed peritoneum, or from vascular pseudo-membranes; (5) hæmorrhage from the lining of a diseased Fallopian tube, generally dilated, but with open ostium; (6) rupture of a cyst in the ovary or broad ligament; (7) rupture of a hæmatosalpinx; (8) rupture of the sac of an early extra-uterine fœtation, or a fœtation in a rudimentary uterine cornu; (9) bleeding from a tubal mole through the open ostium of the tube. Of these the first five are generally menstrual forms of hæmatocele. The two last comprise the great majority of cases. They are generally non-menstrual, but menstruation may occur in tubal fœtation, and determine the epoch of bleeding.

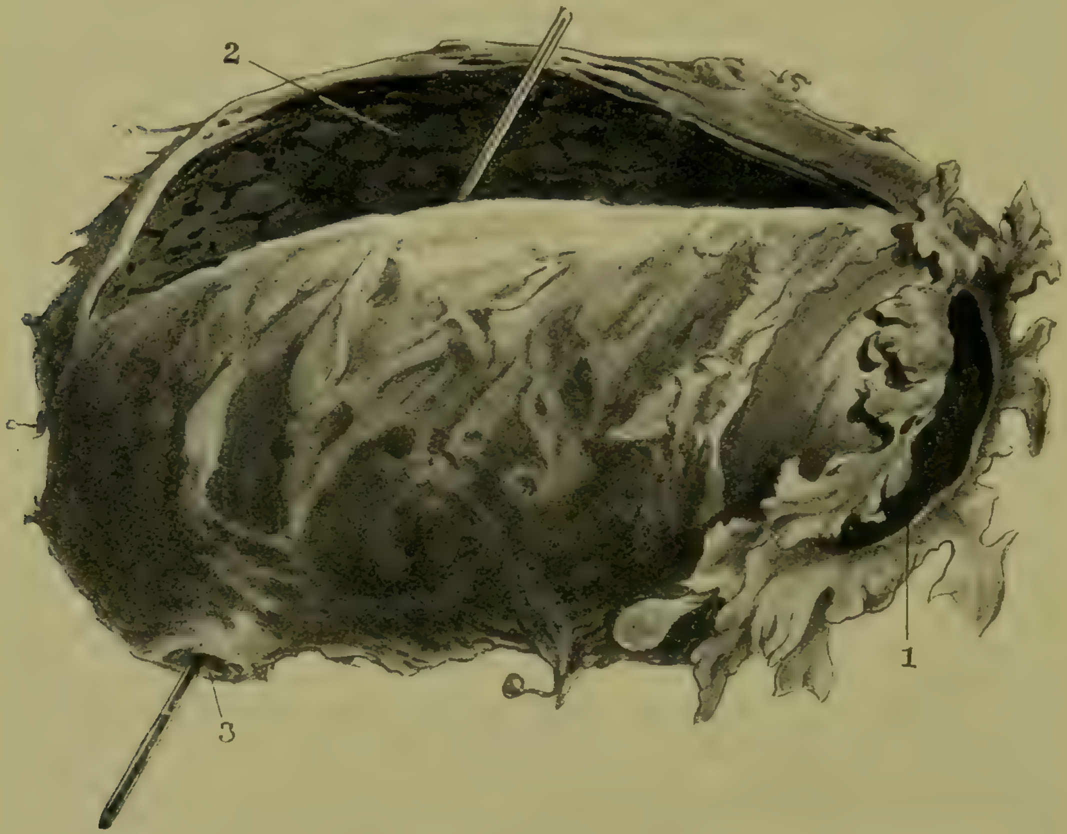

Fig. 261.—Fallopian Tube distended with blood-clot, and associated with Retro-uterine Hæmatocele.

A Fallopian tube (3 inches by 2 inches) distended by blood-clot. The abdominal ostium is wide open, and blood-clot was hanging from it at the time of operation. The tube was surrounded by a large intra-peritoneal hæmatocele (thirty ounces of clot). The clinical history pointed strongly to extra-uterine gestation, but no villi were found. 1, widely dilated fimbriated extremity (diameter of ostium = 1 inch); 2, main cavity of tube occupied by clot (the surface of the tube is covered with firm clot deposited from the hæmatocele); 3, glass rod passed through uterine end of tube.

(After Cullingworth, "Clinical Illustrations of Diseases of the Fallopian Tubes," Plate ix., Fig. 2, and Hubert Roberts, "Outlines of Gynæcological Pathology," Fig. 49)

Modern abdominal surgery has shown not only that the great majority of cases of hæmatocele are due to extra-uterine fœtation, but that, in most of them, the bleeding is not from a ruptured tube, but through the open ostium, generally from a tubal mole. The bleeding is thus more gradual and moderate in quantity. A

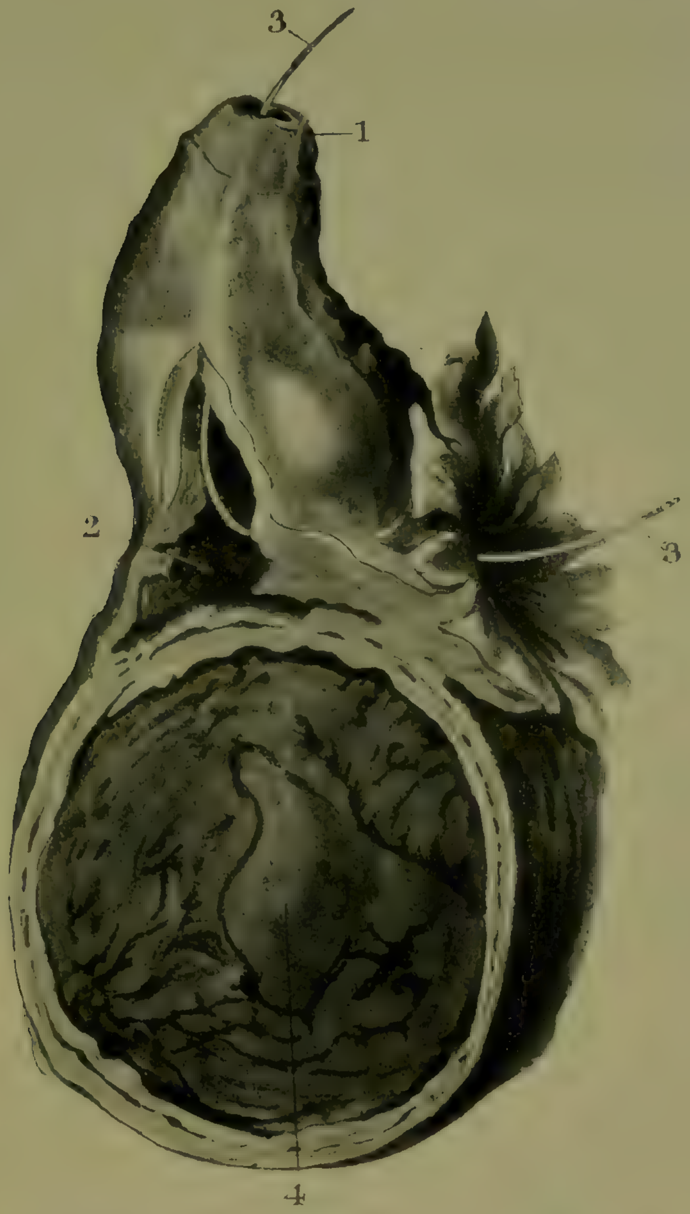

Fig. 262 —Paratubal Hæmatocele, probably due to Tubal Gestation.

A Fallopian tube; in connection with its distal end is a closed cyst-like cavity full of blood-clot. It appears quite separate from the tube, but a healed rupture was found in the tube-wall at its centre. It was probably the result of an extra-uterine pregnancy with formation of a tubal mole, but no villi could be found in the clot. 1, uterine end of Fallopian tube; 2, oblique section through the tube to show the bristle (3); 4, blood-clot in a cystic cavity which does not communicate with the tube.

(After CULLINGWORTH, "Clinical Illustrations of Diseases of the Fallopian Tubes," Plate xi., Fig. 1, and HUBERT ROBERTS, "Gynæcological Pathology," Fig. 43.)

clot is slowly formed at the bleeding site. Some inflammation is set up around it, and a layer of lymph covering it is formed from surrounding viscera. Thus a kind of sac is formed among adherent intestines enclosing the blood. Further gradual hæmorrhage goes into the sac, which becomes more and more distended, presses on surrounding parts, and, if it lies behind the uterus, displaces the uterus forwards and upwards.

In Fig. 261, p. 578, is shown a Fallopian tube distended with blood-clot, which was associated with a large hæmatocele, the blood having escaped through the open ostium of the tube.

There is a special form of hæmatocele called peritubal hæmatocele, in which the blood-clot is contained in a kind of capsule, formed by lymph, and attached to the edges of the ostium. This capsule is not necessarily adherent to surrounding viscera. Peritubal hæmatocele implies a still more gradual bleeding than the ordinary form. The first small portion of clot formed becomes encased by lymph attached to the margin of the ostium, while it is still in close connection to the tube. As further gradual bleeding stretches the capsule so formed, it is thickened by accretion of lymph, and grows gradually larger, retaining its connection with the ostium.

In other cases, a hæmatocele results from rupture of the tube, generally by a small opening. Rupture of the tube, while the ovum is living, generally causes great and diffuse intra-peritoneal hæmorrhage, and does not give the physical signs of a hæmatocele. Rupture causing a hæmatocele generally occurs in the case of a tubal mole, or at any rate of a dead ovum, so that the activity of the circulation has diminished.

An encapsuled hæmatocele may also be formed at the site of a rupture, as the peritubal hæmatocele is at the ostium, and has been called a paratubal hæmatocele. This implies that the bleeding is very gradual indeed. A layer of lymph is formed over the clot, connected with the edges of the opening. As the capsule is very slowly distended, it has time to become organized and gain thickness by accretion of lymph. In Fig. 262, p. 579, is shown a specimen of this kind, which was at first described as a sacculated hæmatosalpinx. The cavity of the blood-cyst is apparently shut off from the lumen of the tube; but later investigation showed a healed rupture in the wall of the tube, corresponding to the centre of the hæmatocele.*

Some of the causes above given have been accepted rather on *à priori* grounds, and are perhaps open to doubt. The following, besides extra-uterine fœtation, have been demonstrated on abdominal section—hæmorrhage from inflamed peritoneum, as a complication of perimetritis; hæmorrhage from the lining of a dilated Fallopian tube without any evidence of tubal gestation. In some of the latter cases it is very difficult to determine whether there has been a tubal gestation or not; but, if both tubes are affected, and no trace of villi can be detected, the presumption is against it. Interstitial hæmorrhage into the ovary has ruptured into the peritoneum and caused fatal hæmorrhage; it is, therefore, capable of causing more moderate hæmorrhage. The cases of hæmorrhage as a complication of perimetritis often occur in the presence of a tumour. They come under notice as cases of inflammation rather than of hæmatocele, and the collection of clot is often only found on abdominal section.

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* *See* Handley, "Paratubal Hæmotocele," "Journ. of Obstet. and Gynæc.," Dec., 1902.

The most questionable of the alleged causes are reflux of menstrual blood from the uterus, and excessive bleeding on rupture of a Graafian follicle.

The *predisposing causes*, apart from the preponderant cause, namely, extra-uterine fœtation, are active or passive hyperæmia of the uterus and adjoining parts, by whatever cause produced; previous disease within the pelvis, especially pelvic peritonitis, obstruction of the cervix uteri or vagina, morbid conditions of the Fallopian tubes or ovaries, or varicose distension of veins; the hæmorrhagic diathesis; and diseased conditions of blood, such as those produced by zymotic diseases, jaundice, purpura, or scurvy.

The *exciting cause* is frequently external violence; muscular strain; coitus, especially during menstruation; or the effect of cold or mental emotion in producing a sudden increase of hyperæmia during the same condition. When the bleeding results from extra-uterine fœtation, the immediate cause of the rupture is often some slight strain or exertion.

Pathological Anatomy.—Pelvic hæmatocele is not excessively rare, but yet undoubted instances of it form a small proportion to cases of parametritis or perimetritis. In the great majority of fatal cases in which an autopsy has been made, the effusion of blood has been reported as being intra-peritoneal, although it has often proved extremely difficult to determine positively the true position of the peritoneum. Again, when an effusion of blood has been found on abdominal section, it has been intra-peritoneal in the majority of cases. It is probable that, in a considerable number of cases which are not distinguished from pelvic cellulitis or peritonitis, the starting-point of inflammation may have been a slight or moderate effusion of blood. On the other hand, retro-uterine hæmatocele is apt to be diagnosed, when the real condition is serous perimetritis, or perimetric abscess, forming a swelling behind the uterus.

Blood effused into the peritoneal cavity tends to gravitate into the retro-uterine fossa, but does not form a tangible swelling there while it remains fluid. When clotting has taken place, there may be a mass to be felt behind the cervix; but the uterus will not be displaced more than it is when the lymph effused in pelvic peritonitis gravitates into the same position. An induration of this kind, but no more, may be formed by gravitation into the pelvis of blood effused, not within the pelvis itself, but elsewhere in the peritoneal cavity. When, however, the amount of blood effused is not sufficient to cause death, it is soon enclosed by false membranes, which separate it from the intestines which it has displaced from the retro-uterine fossa. If further hæmorrhage now takes place within the enclosed space, the uterus is pushed forward and upward, the rectum flattened against the sacrum, and

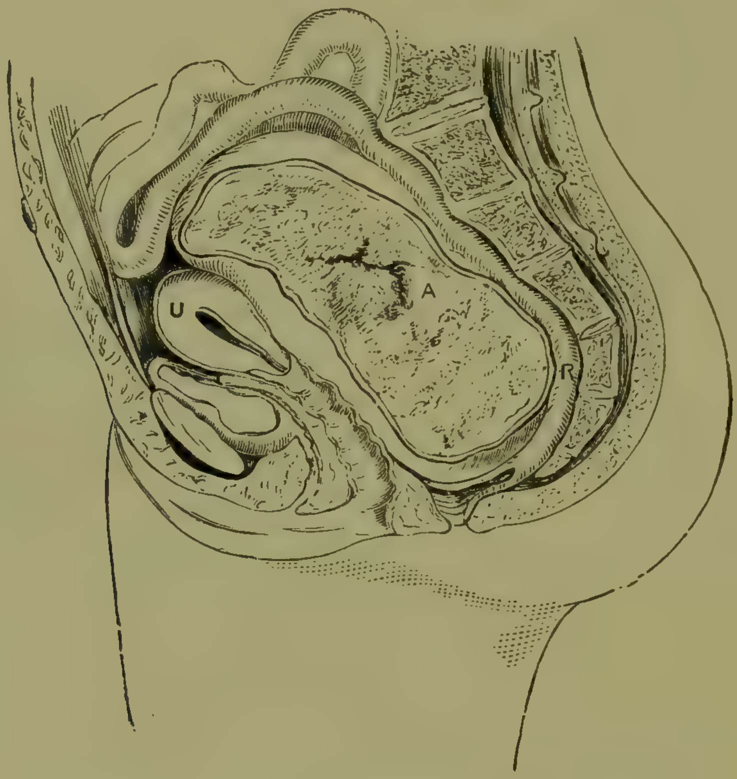

Fig. 263.—Retro-uterine Hæmatocele (after Barnes).

U, the uterus pushed forward; A, the hæmatocele filling the cavity of the sacrum, bounded above by plastic effusions and the small intestines; R, the rectum, compressed by the hæmatocele.

a retro-uterine tumour formed, which may extend upward as high as the umbilicus (Fig. 263). This condition, which constitutes the most typical and recognizable form of hæmatocele, and the one which specially deserves the name of retro-uterine hæmatocele, thus implies, in most cases, either a slow and gradual hæmorrhage or one repeated at intervals, and a source of hæmorrhage in the retro-uterine fossa of the peritoneum. A similar result is produced if the primary hæmorrhage is the sequel of pelvic peritonitis, and takes place into a space limited by previous adhesions.

An intra-peritoneal hæmatocele situated in front of the uterus has occasionally been observed, but it is scarcely possible for it to be confined to that position, unless the retro-uterine fossa has previously been occluded by false membranes.

Results and Symptoms.—In a marked case of hæmatocele of the menstrual variety, where the effusion of blood is considerable, a patient, generally during a period of profuse menstruation, and often from the effect of one of the exciting causes before mentioned, is suddenly attacked by pain, which is quickly followed by faintness, and often collapse, with nausea or vomiting. The loss of blood may be sufficient to produce pallor, but not the extreme anæmia produced by a large diffuse intra-peritoneal hæmorrhage. The external menstrual hæmorrhage is generally considerably diminished, or may be arrested altogether, although frequently it continues to some extent. In other cases, the onset of the attack takes place while menstruation is imminent, or after its suppression, or after partial or temporary suppression, from the effect of cold or emotion, or from early pregnancy.

After a while, symptoms of pressure in the pelvis arise—a feeling as of the presence of a foreign body—with vesical and rectal tenesmus. A swelling may also appear in the hypogastrium, and extend upward towards the umbilicus. At first the temperature may be subnormal, but within two or three days a febrile reaction generally occurs, with symptoms of pelvic or general peritonitis, which may be of greater or less intensity. When, however, the hæmorrhage is slight or gradual, the onset of the attack may be little marked.

In the much more common case in which the cause of hæmorrhage is extra-uterine fœtation, the occurrence more frequently takes place apart from menstruation, and the signs of hæmorrhage are generally more severe. In most cases, there will have been a cessation of menstruation for a short time, with general signs of pregnancy. With, or shortly before, the symptoms of internal bleeding a sanguineous discharge from the uterus generally commences, and continues much longer than the ordinary duration of a menstrual period, usually for several weeks. With the discharge a decidual membrane is often passed. The separation of the decidua, and sanguineous discharge from the uterus, generally mean the death of the embryo, which may occur before the intra-peritoneal bleeding commences.

The persistence of regular menstruation, and even the onset of the symptoms of internal hæmorrhage at what appears to be an ordinary menstrual period, are no disproof of the existence of extra-uterine fœtation.

A recurrence of hæmorrhage at succeeding menstrual periods is not unfrequent, and in this way the tumour may undergo repeated increase in size; otherwise it diminishes and becomes harder by absorption of the serum. Sometimes its contents again become softened in consequence of decomposition or suppuration, and constitutional symptoms of septicæmia may then supervene. In some cases, spontaneous evacuation, before or after suppuration, takes place by rectum, or, more rarely, by vagina. In others the tumour becomes very slowly and gradually absorbed. In rare cases, rupture into the general peritoneal cavity occurs. Death may occur from this cause, or from septicæmia or peritonitis; and the prognosis is always grave when the effusion is of enormous size or when decomposition takes place in it.

Diagnosis.—The diagnosis is easy in a typical case of retro-uterine hæmatocele when the onset has been sudden and well marked. A characteristic history, such as that already described, and a recently acquired appearance of anæmia, afford valuable evidence. At the early stage of hæmorrhage, while the blood is fluid, there may be nothing discoverable on examination, except perhaps a small lump in the position of the Fallopian tube, which may not be distinguishable without the administration of an anæsthetic.

As soon as the blood clots, a lump is formed, extending transversely across the pouch of Douglas, but not at first displacing the uterus much, resembling rather the induration produced by perimetritis (Fig. 259, p. 562), except that it is limited to the posterior half of the pelvis.

Later, in the typical variety of retro-uterine hæmatocele, on vaginal examination a large mass is felt, pressing down the recto-vaginal septum by distension of the pouch of Douglas, and encroaching upon vagina and rectum. The cervix is displaced forwards, and generally upwards, much more considerably than is usual in pelvic peritonitis or cellulitis, except in the case of encysted perimetritis behind the uterus. The fundus uteri is pushed forward against the abdominal wall, so as to be much more readily tangible than usual (*see* Fig. 263, p. 582, and Fig. 264). On bimanual examination, a mass is felt behind, and generally above, the fundus uteri, continuous with that behind the cervix, and sometimes reaching as high as the umbilicus. Such a tumour may be recognized within two days of the first hæmorrhage. The mass is at first somewhat soft and yielding, but becomes gradually very hard and nodular, though it may afterwards again soften. It may generally be distinguished from an ovarian or fibroid tumour behind the uterus by its being more irregular and less globular, as well as by the history.

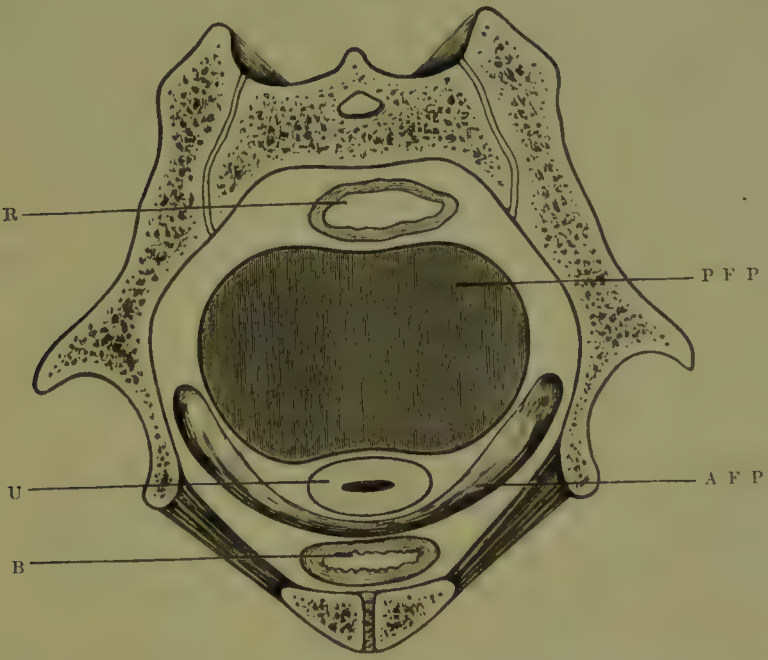

Fig. 264.—Section parallel to pelvic brim, a little above the level of the internal os uteri, showing the situation of induration in Retro-uterine Hæmatocele.

B, bladder; U, uterus, pushed forward; A F P, anterior fossa of peritoneum, pushed forward and free from induration; P F P, posterior fossa of peritoneum, distended with clot; R, rectum.

When the history is not clear, when the amount of effusion is moderate, or when the case is only seen at a late period, there may be much difficulty in distinguishing hæmatocele from other masses which may exist behind the uterus. Such masses may be formed by a retroflexed fundus uteri, pregnant or not, by pelvic peritonitis or cellulitis, especially by a perimetric abscess, or serous perimetritis, fibroid tumours, ovarian tumours, parovarian cysts, hydatid cysts, dermoid tumours, extra-uterine fœtation, a distended Fallopian tube, malignant disease, outgrowths from the pelvic wall, or fæcal accumulations. The distinction is most likely to be difficult between hæmatocele and perimetric effusions, cystic, or dermoid tumours of the ovary, fibroid tumours, or extra-uterine fœtation with a living ovum. The sudden appearance of the tumour of hæmatocele is its chief distinction. (For the distinctive signs of extra-uterine fœtation, *see* pp. 504, 506.) In estimating the value of enlargement of the uterus as a sign of this affection, it must be remembered that involution of the uterus commences as soon as the ovum dies. Thus, in hæmatocele resulting from extra-uterine fœtation, the uterus will be enlarged at first, but will progressively get smaller. A retroflexed uterus will be distinguished by bimanual examination, and the use of the sound if necessary.

When the hæmatocele is of small size, and does not descend low in the pelvis, or when it is situated laterally or anteriorly, the diagnosis may be very difficult, and it may be impossible to distinguish it from pelvic peritonitis or cellulitis, except by means of exploratory puncture, a proceeding generally not to be recommended. In such cases a positive diagnosis is of little consequence as regards treatment. Sometimes the case is cleared up by spontaneous evacuation.

Treatment.—If with symptoms of internal hæmorrhage, even though not severe, a diagnosis is made of extra-uterine fœtation, and the case is seen at an early stage, abdominal section, ligature and removal of the ruptured tube, and removal of all blood and clots, are the best treatment. For it is impossible at first to say whether a slight bleeding will not be followed by a large diffuse intra-peritoneal hæmorrhage. Moreover, the operation is easy at this stage; and the patient will probably recover without any adhesions. Even if no dangerous bleeding follows, if the case is allowed to run the course of a pelvic hæmatocele, adhesions are very likely to form about the uterine appendages of the opposite side, and sterility to be produced. When, however, the typical signs of a retro-uterine hæmatocele are found, it is an indication that the site of bleeding is shut in; and that there is, therefore, some check upon further hæmorrhage. In general, at this stage, it is better not to perform abdominal section, especially if a considerable time has elapsed since the onset of symptoms, unless the mass is found to be increasing rapidly, or there are general symptoms of persistent hæmorrhage, or of rupture of the limited sac into the general peritoneal cavity.

If the decision is against an immediate operation, perfect rest in the horizontal position, or with the pelvis somewhat raised, should be immediately secured, and ice may be applied over the hypogastrium. The best hæmostatic, and at the same time stimulant, is a hypodermic injection of morphia. Ergotin and gallic acid may also be given in the form of pill, or ergot may be administered subcutaneously (*see* p. 382) if the heart is not too feeble. Adrenalin chloride or Oppenheimer's Renaglandin may also be given, if it is thought that there is any hæmorrhage continuing. Alcohol and ether should be absolutely avoided, unless there appears to be imminent risk of death from syncope.

When the febrile reaction occurs, the case should be treated like one of pelvic peritonitis (*see* p. 564). Special precautions should be taken at recurring menstrual periods, particularly by the observance of absolute rest. All early surgical interference in the way of puncture or evacuation of blood *per vaginam* is undesirable, and is especially dangerous before there has been time for the effusion to be shut off completely by adhesion from the peritoneal cavity. There is also risk that fresh hæmorrhage may occur if the blood is drawn off early.

At a later stage, however, if suppuration or softening has occurred, and symptoms of septicæmic fever appear, or if the mass is very large and causes pressure symptoms, or if no progress is made in its absorption, the hæmatocele should be evacuated. A free opening should be made, by the vagina if possible, and clots may be cleared out so far as they can be reached by the finger, care being taken not to break down the limiting adhesions. The blood may be cautiously washed out with sterilized normal saline solution, or a non-poisonous antiseptic, by means of an irrigator used at a low pressure. The cavity should then be plugged with moist iodoform gauze, 10 per cent., and the plug may be tightened if further bleeding takes place. In case of suppuration a large self-retaining drainage tube should be used, as for a pelvic abscess (*see* p. 544), instead of the gauze plug. In either case, the cavity should be washed out at intervals.

If diminution of the tumour is taking place, however slowly, interference should be avoided. In general, apart from decomposition or suppuration, the contents should be evacuated only when the tumour is of such large size as to cause great inconvenience by pressure, and shows no tendency to become absorbed. If comparatively early evacuation is demanded in order to relieve extreme pressure, the aspirator, or a trocar and canula, may be used. If spontaneous perforation takes place, the evacuation may generally be left to nature.

In general, vaginal evacuation is preferable to abdominal section at the late stage, especially if there is any symptom of decomposition or septic infection, unless there is reason to suspect that the extra-uterine fœtation has advanced so far that there is a fœtus present, larger than a minute embryo which may become dissolved. The diagnosis of other abdominal complications, such as a pyosalpinx, might also decide the question in favour of abdominal section.

If abdominal section is performed, it will generally be necessary to separate adherent omentum and intestine to reach the hæmatocele. When the cavity is opened, the clots should be cleared out in handfuls, and the cavity then washed out with sterilized saline solution. The tube which was the source of the bleeding should be removed, if found. If a ragged cavity remains, with much adherent clot, drainage will generally be desirable, through the vagina if possible.

PELVIC HÆMATOMA.

By pelvic hæmatoma is signified an effusion of blood within the cellular tissue of the pelvis. It is rarer than pelvic hæmatocele.

Causation.—Probably by far the most frequent and the most important cause of pelvic hæmatoma is rupture of the sac of an early extra-uterine fœtation into the broad ligament. It may also arise through the rupture of a vessel in the broad ligament from violence, or in consequence of any of the general causes of pelvic hæmorrhage described under the head of pelvic hæmatocele. In the case of extra-uterine fœtation, the bleeding is more likely to be progressive, and the swelling gradually to increase.

Hæmatoma, apart from extra-uterine fœtation, generally occurs from a traumatic cause in patients who are pregnant or recently delivered.

Pathological Anatomy.—This effusion is generally situated in one broad ligament, and distends it somewhat like the effusion of parametritis. If small, it may be limited to the neighbourhood of the uterus. If large, it may extend toward the iliac fossa. I have met with a case in which, by a pelvic hæmatoma. originating from tubal fœtation, the peritoneum was stripped off the back of the uterus and the posterior face of both broad ligaments. A large tumour was thus formed, which could not be distinguished from retro-uterine hæmatocele till the abdomen was opened. In a similar way, the peritoneum might be stripped off the anterior part of the pelvis.

Results and Symptoms.—The effusion, unless of very unusual size, is pretty sure to be absorbed ultimately, and is less likely to break down or suppurate than a hæmatocele. It is possible, however, that secondary rupture may occur into the peritoneal cavity. The symptoms will be those of hæmorrhage and pressure. Febrile disturbance is less likely to follow than in hæmatocele.

Diagnosis.—The diagnosis must be made by a history similar to that of hæmatocele, and the finding a swelling, generally not behind the uterus, but in the position of one broad ligament, resembling the swelling of parametritis. Diagnosis is generally more difficult than in the case of hæmatocele. In the rare case, mentioned above, of hæmatoma behind the uterus, the swelling differed from that of hæmatocele in being more globular and elastic, simulating an ovarian cyst. In most cases I have found that the swelling formed by hæmatoma differs in this way from that due to hæmatocele, which, after the early stage, is harder, and more often irregular. A hæmatoma is slower in being absorbed, and longer retains some fluid blood in its cavity. A case has been recorded in which a hæmatoma which stripped the peritoneum off the uterus formed a movable tumour attached to the uterus, simulating a fibroid tumour.

Treatment.—There is more reason than in the case of hæmatocele for leaving matters to nature, in the confidence that the effusion will be ultimately absorbed. The operation, however, of evacuation *per vaginam* is a very simple one, and, in cases in which the swelling does not soon begin to diminish, will accelerate the cure. An incision is made through the vaginal wall, as near as possible to the centre of the swelling, but inside the course of the ureter. Narrow-pointed sinus forceps are pushed into the tumour and expanded. The opening is enlarged till the clots can be cleared out with the fingers. The cavity is then washed out, and plugged with moist iodoform gauze. This is changed at intervals of two or three days, and the cavity washed out each time.

Not unfrequently the diagnosis is doubtful, and the hæmatoma may be found when an exploratory abdominal incision is made. The hæmatoma should then be opened in the same way from the vagina, and its position can be determined with greater certainty by aid of the abdominal incision. In case of signs of suppuration or sepsis appearing, the hæmatoma should be opened at once from the vagina.

DIFFUSE INTRA-PERITONEAL HÆMORRHAGE.

Some causes of a large intra-peritoneal hæmorrhage are common to both sexes, such as the rupture of an aneurism, or bleeding from a perforated ulcer or from the surface of a cancer. But the most common cause of a sudden and profuse hæmorrhage lies in the female generative organs, and especially in a ruptured tubal fœtation.

Causation.—In extra-uterine fœtation, the most common cause of a large hæmorrhage is rupture of a tubal fœtation within the first eight weeks of pregnancy. A tubal abortion sometimes causes bleeding so profuse as to simulate ruptured tubal fœtation. A tubal mole rarely does so, so long as the mole remains within the tube. At a later date, hæmorrhage may occur from secondary rupture of the sac of an intra-ligamentous pregnancy, from separation of the placenta in abdominal pregnancy, or from rupture of a hæmatoma, which generally has had its origin in a tubal fœtation.

A few cases of rupture of a varicose vein in the broad ligaments have been recorded, not necessarily in any relation to pregnancy. They have proved rapidly fatal before any treatment could be adopted.

Bleeding may occur into an ovarian cyst, rupture the cyst, and then further bleeding continue into the peritoneal cavity. This is especially liable to occur in the case of cysto-carcinoma. Profuse bleeding may also occur from the surface of papillary cancer of the Fallopian tubes, ovaries, or uterus.

Soft carcinoma or sarcoma of the uterus may cause rupture and bleeding into the peritoneal cavity. Pregnancy in a rudimentary uterine horn, or the sac of a tubo-uterine pregnancy, may rupture like an extra-uterine fœtation. A very few cases have been reported of rupture of the pregnant uterus, not in labour, without obvious cause.

A very few cases have also been recorded of fatal hæmorrhage into the peritoneal cavity from an ovary ruptured by interstitial hæmorrhage into its substance, or into a blood-cyst formed within it. Now that it has been proved that ovarian fœtation may occur, it seems to be possible that these, or some of them, may have been instances of it.

Diagnosis.—There is a sudden onset of pain, not always severe, followed by collapse and pallor, with breathlessness, and often fainting. Vomiting is often prominent, and the pulse is rapid and feeble. There may be evidence of fluid in the abdomen, with dulness in the flanks. Possibly a lump may be felt at one side of the uterus. The only other condition giving rise to similar symptoms is perforation of an ulcer of the stomach or elsewhere in the alimentary canal. Hæmorrhage is generally distinguished by the greater degree of anæmia, and the pain not having commenced in the gastric region, nor having been preceded by chronic gastric symptoms.

Treatment.—Abdominal section should be performed as early as possible. A fair-sized incision is made, and the operator feels at once for the uterine appendages; and, if any lump or anything abnormal is found there, pulls it up into the incision. A thin Doyen's clamp may be placed on the ovarian vessels till the ligatures are applied. In the case of an early tubal fœtation, the sac is generally free from adhesions, and is easily removed. In the case of intra-ligamentous or abdominal pregnancy at a later date, the whole sac and placenta should be removed if possible.

In a ruptured tubo-uterine fœtation it is generally advisable to remove the uterus. It may be preferable to operate by the method of the old Porro operation (*see* p. 406), with extra-peritoneal treatment of the pedicle, especially if the operation has to be done by an operator without much experience in abdominal sections.

Normal saline fluid for intra-venous injection should be ready before the operation, but should not be injected till the bleeding vessels have been secured, unless the patient appears to be otherwise moribund. As soon as the bleeding is arrested, the injection may be made with advantage by an assistant during the course of the operation, if the patient is in a bad condition. Several pints of saline fluid are often injected with advantage, by the method described at p. 84.

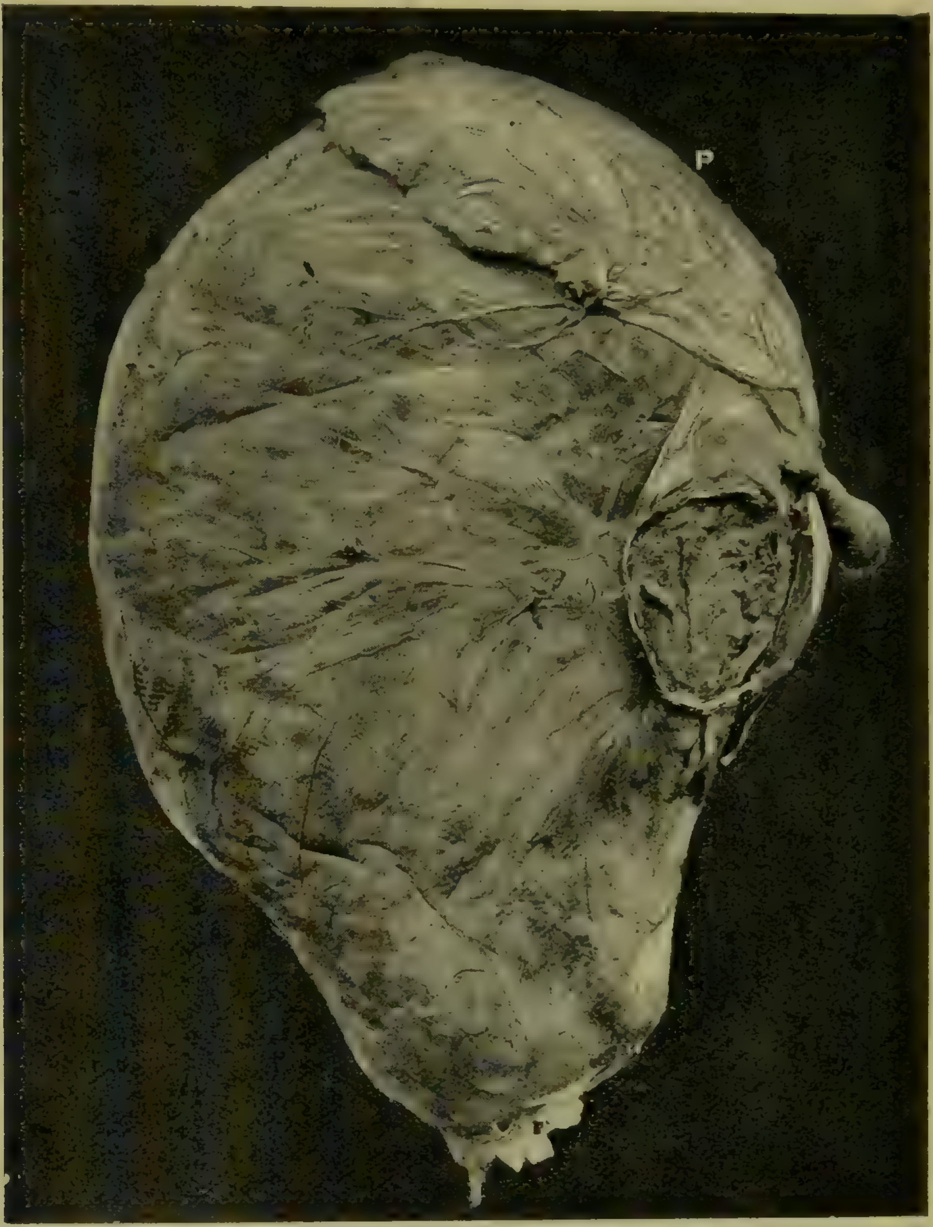

Fig. 265.—Large Fibro-myoma of Broad Ligament, removed by the Author.
P, peritoneum.

The best mode of removing the blood is to wash out the peritoneal cavity with a large quantity of sterilized normal saline solution. In an emergency, plain water may be used. Drainage is generally not required, unless a placenta has to be left.

Tumours of the Broad Ligaments.

Parovarian cysts and simple cysts of the broad ligament have been described in connection with ovarian cysts.

Besides uterine fibroids growing from the fundus or cervix, which may burrow into the broad ligament and retain but a slight connection with the uterus, fibro-myomata may arise in the broad ligament from the layer of involuntary muscular fibres which is found chiefly on its surface. These may grow to a very large size, and are apt to strip up the peritoneum from the front or back of the abdominal cavity, so as to be mainly extra-peritoneal.

In Fig. 265 is shown a large fibro-myoma, moulded to the shape of the pelvis and abdomen, which had commenced in the outer part of the left broad ligament, and grown up under the sigmoid flexure behind the retro-uterine fossa of peritoneum, which separated it from the uterus and ovaries. The small portion of peritoneum covering it is seen at the top. The sigmoid flexure was stretched over its greatest circumference, and partial intestinal obstruction had been produced. The tumour was enucleated out of cellular tissue, and the edges of the cavity stitched to the abdominal wound. The structure showed a larger proportion of fibrous tissue than is usual in myoma of the uterus. A tumour of this kind, removed by Sir Spencer Wells, weighed 68 pounds; and one removed by Doran, 44½ pounds. In some tumours in this situation the structure has appeared to be rather that of spindle-celled sarcoma.

Diagnosis.—The uterus may be distinguished as separate from the tumour, and not enlarged. It will usually be impossible to be certain before operation whether the tumour is an outgrowth from the uterus or originates in the broad ligament. The growth will be more fixed than a myoma or fibroma of the ovary.

Treatment.—Removal will be called for if the tumour is growing to a large size, and causing pressure symptoms. The operation is difficult, as the tumour has to be enucleated from a great extent of cellular tissue, vessels from which enter at all sides. Vessels must be secured as they are divided. The cavity left should be isolated, if possible, from the peritoneal cavity, and drained.

Fibro-myoma of the Round Ligament may grow either within the abdomen or in the inguinal canal. Tumours of this kind have been recorded as large as a cocoanut, and have required operation.

Fibro-myoma of the Ovarian Ligament is generally small, and of little importance.

Cysts of the Urachus or Allantois of considerable size have been recorded, sometimes communicating with the bladder.

Fibroma or Spindle-celled Sarcoma of the Abdominal Wall, probably originating in the fascia, seems to have some relation to the sexual system. Of thirty-eight cases collected by Grätzer, thirty-three occurred in women. They are apt to originate or increase rapidly during pregnancy. An increasing tumour in this situation should be removed without delay, since it is likely to be sarcoma.

CHAPTER XIII.

DISEASES OF THE VAGINA AND VULVA.

VAGINITIS.

INFLAMMATION of the mucous membrane of the vagina is called vaginitis, or, with stricter etymological propriety, "colpitis."

Causation.—The bacteriology of the vagina, and its relation to inflammation, has already been considered in reference to endometritis. While microbes abound in the vagina, some authorities say that in the normal vagina the common micrococci of suppuration are absent; others, that they may be present, but that their pathogenic character is abolished or diminished. The latter appears the more probable, since, in the presence of innumerable microbes of various species, it is difficult to prove the absence of any one. The condition adverse to the growth of pathogenic microbes is attributed to the action of the peculiar bacillus, the bacillus of Döderlein, which causes the acid reaction of the vaginal secretion; but the original character of the secretion itself may have something to do with it.

The most acute form of vaginitis is produced by gonorrhœa. The vagina is, however, not the favourite locality of the gonococcus, which flourishes more and persists longer in the vulva, urethra, and cervix uteri. Thus Laser, in examining prostitutes, found the gonococcus in the vagina in 3·8 per cent., in the urethra in 31·6 per cent., in the cervix uteri in 30·4 per cent. The gonococcus appears to facilitate the growth of other pathogenic organisms, so that in the later stage there may be a mixed infection, or other micrococci of suppuration may be found without the gonococcus.

Vaginitis may also be produced by cold, sexual excess, parturition, the presence of a pessary or other traumatic cause, the irritation of acrid uterine discharge, or may arise in the course of zymotic diseases, as measles or scarlatina. It is promoted by want of cleanliness, and by any cause of venous congestion, local or general. Most of these causes act by impairing the vitality of the mucous membrane, and rendering it vulnerable to microbes not otherwise pathogenic. The effect of so-called cold, however, may often be a degenerated influenza.

Severe purulent inflammation, so acute as to raise the suspicion of gonorrhœa, may be associated with microbes other than the usual pyogenic micrococci, especially with some peculiar forms of bacillus. These may set up urethritis in the male sex, and ophthalmia, but neither is so severe or prolonged as that due to the contagion of gonorrhœa.

Conditions which cannot be demonstrated as inflammation, but have some of its characters, including swelling of the mucous membrane and excess of secretion from its surface, may arise from causes of congestion, such as pregnancy, the puerperal state, sexual excess, or sexual excitement. Chronic catarrh is most frequently the sequel of more acute inflammation, or the result of irritating uterine leucorrhœa. It may also arise from any of the causes already mentioned, acting in a less acute degree, and is especially liable to exist in debilitated women, or those of strumous, gouty, or rheumatic diathesis.

Pathological Anatomy.—At the onset of acute catarrhal inflammation, the mucous membrane is swollen and congested, and its secretion diminished. After a day or two the secretion is increased and becomes purulent or sero-purulent. There is then great injection of the mucous membrane, especially upon the summits of its folds; and small ecchymoses may be formed in its substance, or superficial abrasions upon its surface. The gonorrhœal form of vaginitis is more frequently limited to the lower portion of the canal, and affects the vulva, urethra, and vulvo-vaginal glands more than the vagina. The discharge is yellow or greenish, often offensive, especially in uncleanly persons.

In chronic catarrh, the secretion contains a large quantity of epithelial cells, with a variable proportion of mucus and pus corpuscles. When there is any admixture of pus, the *Trichomonas vaginalis*, an infusorium possessed of one long cilium, is often present. From long-continued catarrh, the vaginal walls become relaxed, and the mucous membrane thickened.

The term "*Granular Vaginitis*" is given to a chronic form of inflammation, in which the mucous membrane feels rough to the finger from the existence of numerous minute elevations. These are attributed to hypertrophy of papillæ. They can also be seen as elevated red spots, which often exist on the cervix uteri as well as the vagina. In some rare cases, especially in connection with pregnancy and parturition, minute cystic gas-containing elevations are formed, due to the action of the *Bacillus aerogenes capsulatus.* In both acute and chronic vaginitis the vulva commonly takes part in the inflammation, and very frequently the redness of the mucous membrane is greater at the lower part of the vagina and at the vulva than in the upper part of the canal. This may often depend upon the secretion becoming more irritating through exposure to air. In other cases, especially those in which the vaginitis is kept up by uterine discharge, the upper part of the vagina, around the cervix, is most affected.

In some cases of very severe inflammation of the mucous membrane, as those produced by pessaries or other foreign bodies, by highly acrid discharges, by exposure and violent friction in consequence of prolapse, or more especially in septicæmic conditions following any lesion, the epithelium may be thrown off, and adherent diphtheroid exudations may be formed upon the surface. Adhesion of the vaginal walls or cicatricial contraction is then apt to follow. The vagina may also be affected by true diphtheria.

In *Senile Vaginitis*, occurring chiefly after the age of sixty, there is an atrophic condition which reduces the resisting power of the mucous membrane. Red patches form, with loss of epithelium, and there is a marked tendency to adhesion and contraction, reducing the calibre of the canal.

Exfoliative Vaginitis has been described as a special form. It occurs chiefly in hysterical women; and there is a doubt how far it may be due, in some cases, to caustic applications.

Vaginitis Mycotica is due to fungi of a higher order than bacteria, such as *Oïdium albicans*, *Monilia candida*, and *Leptothrix vaginalis.* It is promoted by pregnancy, and is most apt to occur in women with a lax, gaping vulva. It may be derived by contagion from the thrush of infants. The affection begins at the vulva, and may extend thence to the vagina. The mucous membrane becomes swollen and red, and covered with little white patches. It is generally dry and without discharge; but, if there is a discharge, it is excoriating in character.

Results and Symptoms.—In acute catarrh there may be some febrile disturbance. Burning, aching, and throbbing are felt in the vagina. After the first day or two the discharge is profuse, and yellow or greenish. Often it is offensive, and by its acrid quality excoriates the vulva and surrounding parts. Generally there is vesical tenesmus, and smarting on micturition. The vulva and vagina are very tender, so that even the careful introduction of a single finger produces much pain. In the chronic form there may be the same symptoms in milder degree, or the presence of discharge may be the only one noticed.

Diagnosis.—The degree of inflammation of the mucous membrane is best judged of by inspection with the aid of the speculum, or without it if there is so much tenderness as to render its introduction painful. The speculum will also show how much of the discharge is coming from the cervix. If necessary, microscopic examination will distinguish the epithelial cells, or epithelial cells mixed with pus, of the vaginal discharge from the mucoid or muco-purulent secretion of the uterus. In case of doubt, uterine discharge may be distinguished from vaginal by keeping a tampon applied against the cervix for a certain time. But in general, vaginal and cervical inflammation are coexistent, and have to be treated together.

The chief difficulty in diagnosis is to distinguish gonorrhœal from simple inflammation. The chief characters of gonorrhœa are its sudden onset; the markedly yellow or greenish colour, offensive smell, and irritating quality of the discharge; the smarting on micturition produced by inflammation of the urethra; the preponderance of inflammation at and near the vulva; the occurrence of inflammation or abscess in the vulvo-vaginal glands, the ducts of which often become distinguishable as injected points just in front of the hymen or its remnant; and the communication of contagion to the male. A drop of pus can, in gonorrhœa, often be squeezed from the urethra, or from the ducts of the vulvo-vaginal glands. The occurrence of marked œdema of the vulva, buboes, or consequent peritonitis, furnish still stronger evidence of gonorrhœa. A conclusion based upon all these signs, or the majority of them, would be right in ninety-nine cases out of a hundred; but, since a vaginitis dependent upon other microbes may possibly have the same characters, it is never safe to pronounce an absolute affirmative opinion as to origin from gonorrhœal contagion, without identification of the gonococcus.

The diagnosis of gonorrhœa by means of the gonococcus has already been described (*see* p. 176). The presence of the gonococcus is, of course, not an absolute proof of sexual contagion. Thus, in the purulent vulvo-vaginitis of children, a diplococcus not to be distinguished from the gonococcus histologically, and not retaining the Gram's stain, is said to be present in the majority of cases;

although they do not, as a rule, arise from any sexual contagion. A chronic or recurrent gonorrhœa often presents no obvious sign, except its contagious quality, by which it can be distinguished from an ordinary form of simple inflammation. The presence even of the gonococcus is difficult to ascertain if it forms only a small proportion among numerous other microbes.

Treatment.—If gonorrhœa is diagnosed, germicide douches should be used from the first, after thorough cleansing of vulva and vagina. One of the best is perchloride of mercury, from 1 in 4,000 to 1 in 2,000, to be used in the dorsal position. Chloride of zinc, from 10 to 20 grains to the pint, is also of value. If the patient can tolerate a speculum, an application may be made of solution of nitrate of silver (gr. x. ad ℥j.), or protargol (gr. xx. —xxx. ad ℥j.), poured into a small Ferguson's speculum, by means of which it is brought into contact with every part of the vagina and cervix. This may be repeated at intervals of three days. The douches should be used three or four times in the day. Rest in bed and warm hip-baths are advantageous.

In acute vaginitis, not of gonorrhœal origin, warm hip-baths, and injections with emollient and sedative fluids, as decoction of poppies, or a weak decoction of linseed or starch with the addition of a drachm of laudanum to the pint, should be used, the patient being placed in the dorsal position for the injections. If the patient can bear it, these medicated injections may be preceded by the injection of a large quantity of hot water between 100° and 110°, as hot as the patient can comfortably bear it, either by the Higginson's syringe or irrigator, in the manner described at page 204. The hot-water injections may be repeated at intervals of a few hours. Complete rest in bed also affords relief.

A little later a warm solution of borax, chloride of ammonium, bicarbonate of soda, or acetate of lead (ʒj. ad Oj.), or the liquor plumbi subacetatis dilutus, may be used. Tampons of tamponite (cotton with sheep's wool) soaked in glycerine containing a small proportion of carbolic acid (1 in 200) may be placed in the vagina in the intervals, and the vulva may be protected from the irritating effect of the discharge by vaseline or cold cream. After subsidence of the more acute symptoms, the injections may be made more astringent by alum, tannic acid, or sulphate of zinc (ʒj.—ij. ad Oj.). A lotion containing forty grains of carbolic acid and the same quantity of sulphate of zinc, or forty to sixty grains of sulphocarbolate of zinc to the pint, is also very useful, especially in gonorrhœal forms of inflammation. In the chronic results of gonorrhœa, other antiseptic lotions are also useful, especially chloride of zinc (gr. x.—xxx. ad Oj.), perchloride of mercury (gr. iij.—vj. ad Oj.), and liquor carbonis detergens (ʒss.—ij. ad Oj.). All these should be used very weak at first, and afterwards increased in strength. Of these injections the tannic acid and lead lotion have the disadvantage of often staining linen indelibly. (For the mode of administering injections effectually, *see* p. 204.)

In the acute stage, laxatives and salines, especially the citrate or acetate of potash, should be given. With these may be combined drachm doses of tincture of hyoscyamus in camphor-water, or infusion of uva ursi if there is any urethral or bladder inflammation. Alcohol must be absolutely avoided.

If the inflammation is becoming chronic, or injections fail to relieve it, a tampon, large enough to keep the vaginal walls separate, and soaked in glycerine containing acetate of lead, sulphate of zinc, or tannic acid (gr. xx.—lx. ad ℥j.), may be introduced from time to time, and left from twenty-four to forty-eight hours. In very chronic cases, astringents, such as tannin or alum, applied in the form of a powder are often useful. The same drugs may be used in the form of suppositories, which are best made with glycerine and gelatine. Ichthyol in glycerine (10 per cent.), applied by means of tampons, may be of use for chronic vaginitis, especially if associated with cervical inflammation (*see* p. 208). In the intervals, warm-water injections should be freely used to wash away secretions, and warm water should also be employed before using the medicated lotions.

It is also serviceable to apply occasionally to the whole vaginal walls a solution of nitrate of silver containing ten or twenty grains to the ounce, or, in more obstinate cases, to apply, at longer intervals, one containing from thirty to sixty grains to the ounce. Protargol may be used in solutions of about double this strength; it is less irritating, and does not stain like nitrate of silver. The most convenient mode of doing this is to pour the solution into Ferguson's speculum, while the patient is in the dorsal position. By altering the direction of the speculum, and finally withdrawing it very slowly, the liquid is brought into contact with every part of the vagina. When the outlet is reached, the fluid is poured out by tilting up the speculum, or mopped up by a tampon of absorbent cotton.

Carbolic acid (ʒij.—iv. ad glycerini ℥j.), tincture of iodine, or even, in obstinate cases, the strong carbolic acid, may also be applied with a mop of cotton to the whole of the vaginal walls through Ferguson's speculum. In using the stronger applications the sensitive structures of the vulva should be avoided. But when the weaker one (such as nitrate of silver, gr. x.—xxx. ad ℥j.) is used, and there is vulvitis as well as vaginitis, the solution may afterwards be applied thoroughly with a swab of cotton to the vulva. Meantime, any cause of passive hyperæmia which tends to promote excessive secretion should be removed as far as possible. In debilitated or anæmic patients, tonic remedies, and especially iron, should be given. Chronic forms of vaginitis can frequently only be cured by treating the cervical or corporeal endometritis which keeps them up.

MALFORMATIONS, DISPLACEMENTS, AND ATRESIA OF THE VAGINA have been considered in connection with the corresponding conditions of the uterus.

CICATRICES OF THE VAGINA, producing contractions or partial atresia, are generally the result of injury in labour, sloughing after parturition, or the incautious use of caustics. If they cause great inconvenience, superficial incisions should be made in them, followed by dilatation. The vagina should be plugged for a few hours immediately after the incisions, or, if possible, a Sims' dilator of glass (Fig. 273, p. 635) should be at once introduced, and worn either continuously or for some hours daily. Care should be taken to use frequent antiseptic injections, and to keep the patient in bed for a few days. To prevent the tendency to subsequent contraction, a Hodge's pessary may often be used with effect, if the cicatrices affect the posterior cul-de-sac, or upper part of the canal. If the upper part is free, and the lower part only contracted, a Sims' dilator of vulcanite may be substituted for that of glass, after the incisions have healed, and worn daily for at least some hours.

MYOMATOUS, FIBROUS, OR SARCOMATOUS GROWTHS occur in rare cases in the vaginal walls, or assume the form of polypi. In the latter case they may easily be removed by the écraseur or scissors. If sessile they must be dissected out, and the gap closed by sutures of chromic catgut. A myomatous growth has been recorded as large as a fœtal head.

VAGINAL CYSTS are found more commonly than solid growths. They generally contain a clear glairy fluid, and appear to result from a gland-like invagination of the mucous membrane, or from occlusion of glands which may occasionally occur in the vagina. Sometimes they are multiple and very numerous. If small or moderate in size, they may be dissected out entirely, and the mucous membrane stitched over the gap with sutures of chromic catgut, which are left to dissolve out. If very large, the superficial part may be excised, and, if there is bleeding, the vaginal mucous membrane may be stitched to the remnant of the lining of the cyst, which will eventually be converted into squamous epithelium.

Cystic cavities elongated longitudinally are sometimes found, especially near the upper part of the vagina, either on the posterior or anterior wall. In the former case they may simulate a vaginal hernia carrying down the pouch of Douglas. They appear to be congenital abnormalities, and may sometimes arise from Gärtner's ducts, or from an imperforate half of a double vagina, which does not lie at the side, but has become rotated. The cavity should be incised, and the septum between it and the vagina cut away.

PRIMARY EPITHELIOMA OF THE VAGINA is very much more rare than that of the cervix uteri or vulva. It may occur in old women, in an infiltrating form, producing an annular constriction or a uniform infiltration of the whole canal. A circumscribed papillary form occurs in younger women, generally on the posterior vaginal wall.

Secondary carcinoma or epithelioma may occur by extension from the cervix uteri, or vulva, or as a metastasis, probably set up by local infection from the cervix. The latter sometimes occupies the position where the posterior vaginal wall comes in contact with the cervical growth. It may also spring up at the site of any tear or abrasion produced in the course of an operation on the uterus, or by the use of a speculum.

Sarcoma of Vagina is still more rare than epithelioma, but occurs sometimes in quite early life, even in infancy. The structure is generally a combination of spindle and round cells. The growth is highly malignant, and apt to recur quickly after removal.

The symptoms are similar to those of cancer of the cervix, but hæmorrhage is not usually so considerable. In infiltrating carcinoma, difficulty in micturition and lancinating pain may be the chief symptoms. In papillary epithelioma the first symptom is frequently pain and hæmorrhage on coitus. In an early stage the disease may possibly be confounded with syphilitic ulceration. Cancer is distinguished by its friable surface, with hard base and edges, by its greater proneness to bleed on touching, and also by its resisting syphilitic remedies.

Treatment. — Epithelioma in the early stage should be removed, if possible, by the knife or the galvanic or benzoline cautery, or it may be excised with the knife or scissors, and the cautery applied afterwards. If practicable, it is best to operate by knife or scissors, and close the gap by sutures.

Frequently it will be advisable to make a transverse incision through the perineum, separate the vagina from the rectum, and remove the whole posterior vaginal wall to a point well above the growth. Afterwards the lateral borders of mucous membrane should be stitched together, if possible, with chromic catgut. It is not expedient to attempt extirpation, if, in order to do so, it is necessary to make a hole in rectum or bladder which cannot be closed.

In general, the disease rapidly spreads in the loose cellular tissue beneath the vaginal wall, and extirpation soon becomes impossible. In the more advanced stage, if there is a prominent papillary growth with a sloughy surface, producing much hæmorrhage or fœtid discharge, some relief may be afforded by the use of the sharp spoons, cautery, or caustics, in the mode described under the head of Cancer of the Cervix Uteri (*see* p. 445). As palliative treatment, in inoperable cases, antiseptic and astringent douches, and opiates if required, should be used, as for cancer of the cervix.

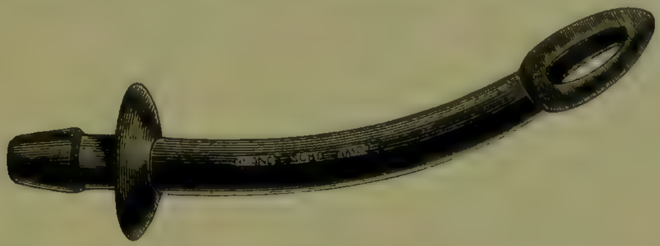

Fig. 266.—SKENE'S Self-retaining Catheter.

TUBERCULOSIS OF THE VAGINA is rare compared with that of the Fallopian tubes and uterus. It is almost invariably associated with tubercle in other parts of the body; but in tuberculosis of the Fallopian tubes the vagina may be affected without the uterus, generally at the posterior wall, where the secretion from the uterus comes in contact with it. A tubercular ulcer, generally at the lower part of the vagina, may arise from contagion conveyed from without, as from a husband with a tubercular testis. In secondary tuberculosis there may be miliary tubercles diffused over the vagina, or localized tubercular ulcers. The ulcers may lead to fistulæ opening into the bladder or rectum.

Diagnosis.—The ulcer will have to be distinguished from a syphilitic ulceration or commencing cancer. It will generally be aided by evidence of the presence of tubercle elsewhere. In doubtful cases the question may be decided by the finding bacilli, or by inoculation of the discharge into guinea-pigs.

Treatment.—A primary tubercular ulcer may be excised. In secondary tuberculosis, treatment should be limited to curetting the ulcers, and the use of antiseptic douches.

VULVITIS.

The vulval secretion has not the same protective quality against pathogenic microbes as that of the vagina. Acute purulent vulvitis is most frequently due to gonorrhœa, but may be dependent upon other micrococci of suppuration.

Even the purulent vulvitis of children, though it is rarely due to any sexual infection, is said to be in the majority of cases due to the gonococcus, or to a coccus indistinguishable from it histologically, and resisting the Gram stain.* In children the vagina is affected more than in the gonorrhœa of adults, but the inflammation rarely extends to the cervix uteri, a peculiarity which may depend upon the resisting power of the vagina in the absence of direct conveyance of the infection inwards. Ophthalmia is rarely produced by contagion, a fact which seems to indicate that, if the infection is really gonorrhœal, it must be of attenuated virulence. Cases sometimes occur, however, of secondary peritonitis in children, indicating the spread of the infection through the uterus and Fallopian tubes.

In milder and non-purulent forms of inflammation the vulva is often affected in conjunction with the vagina, and from the same causes which produce vaginitis (*see* p. 595). The vulvitis may be due to irritation, or conveyed contagion, from the discharge produced by vaginitis or endometritis.

In acute vulvitis, and especially in gonorrhœa, the vulvo-vaginal glands become inflamed, and a drop of pus may often be squeezed from the duct. Acute abscess of the vulva may result, or the sequel may be obstruction of the duct, and production of a retention cyst.

Gouty subjects are liable to an obstinate form of vulvitis, sometimes combined with eczema of the parts around. This may be associated with an unimportant glycosuria. True diabetes may cause a severe form of vulvitis, and it is important to look out for the presence of this disease, especially in women rather beyond middle life.

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* *See* Drummond Robinson, "Obstet. Trans.," vol. xli., 1899, p. 14.

Either after subsidence of vaginal gonorrhœa or other forms of acute vaginitis, as a sequel of marriage, or, occasionally, even in virgins, a very chronic and obstinate inflammation of the vulva may exist, generally most acute at its posterior part, affecting especially the hymen or its remnant, and extending to the fourchette. It may be associated with superficial excoriations or fissures, and is the condition which most commonly gives rise to the symptoms of vaginismus (*see* p. 668). Dr. Matthews Duncan described, as one form of vaginismus, a form of obstinate and recurrent superficial excoriation, which he regarded as analogous to lupus, finding it occasionally to be associated with small tubercles. This he considered to be curable only by application of the actual cautery, or strong caustic, such as nitric acid. The irritation of pediculi pubis may lead to inflammation of the parts of the vulva covered by hair, including pustules and excoriations from scratching.

Adhesive Vulvitis.—Not unfrequently in young children the inner surfaces of the nymphæ and posterior portions of labia majora are found adherent. The outlet is not occluded, but the union may extend far enough forward to interfere with the stream of urine. This arises from a vulvitis, which has produced an erosion of the surface. If neglected in childhood, it may appear as a firmer union in the adult.

Follicular Vulvitis (Fig. 267, p. 606) is a chronic form of inflammation, in which either the mucous or sebaceous glands of the vulva may be inflamed and enlarged. In the former case the vestibule is chiefly affected; in the latter, the enlarged follicles are seen most on the nymphæ and internal surface of the labia majora, and the parts may be covered with an offensive cheesy secretion. This affection may be the cause of severe pruritus or vaginismus.

Treatment.—If a gonorrhœal vulvitis is discovered before the vagina is implicated, douches should be avoided. The vulva should be thoroughly cleansed with the aid of hip-baths. The antiseptics previously described (*see* p. 599) should be locally applied, and kept between the labia by pledgets of lint. Rest in bed is advisable in the acute stage.

In less severe and non-gonorrhœal forms of vulvitis a similar treatment should be adopted, with the local use of milder astringent and sedative lotions.* The vulva may also be painted with a weak solution of nitrate of silver (gr. x. ad ℥j.) every other day; or, in obstinate cases, with a stronger solution (gr. xx.—xl. ad ℥j.) at longer intervals.

In chronic vulvitis, care should be taken to cure any irritating uterine or vaginal discharge. In the form with excoriations or fissures, associated with vaginismus, if the means above described fail, the mucous membrane may be brushed over occasionally with equal parts of strong carbolic acid and glycerine. In chronic vulvitis, especially in elderly and gouty patients, constitutional treatment, especially by saline purgatives, abstinence from alcohol, and a somewhat sparing diet, are of much importance.

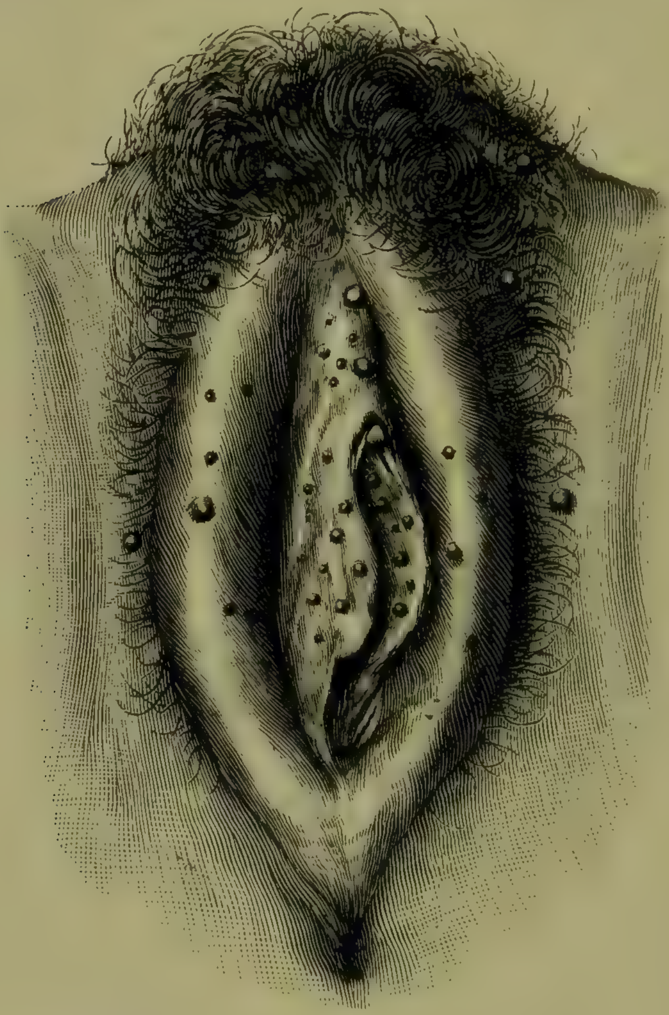

Fig. 267.—Follicular Vulvitis (after Huguier).

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* The following is a useful formula :—Ext. opii gr. iv.; glycerini ʒj.; liq. plumb. subacet. dilut. ad ℥j. Solution of boric acid gr. x. ad ℥j. may also be used.

The purulent vulvitis of children should be treated by frequent ablutions with antiseptic and mild astringent lotions such as chloride of zinc. gr. x.—xx. ad Oj. At the same time good diet and tonics, especially cod-liver oil and iron, should be given.

In the adhesive vulvitis of children the adhesion should be separated by a blunt instrument, such as a bladder sound, passed from the front backward behind the adhesion; and the mother or nurse should be directed to prevent adhesion taking place again.

In follicular vulvitis, pustules or furuncles should be opened. In the acute form the parts may be fomented with an antiseptic compress, as chinosol, 1 in 1,000. In a chronic form, ointments may be used.

Ointments in general are found most valuable when it is necessary to protect the mucous membrane from an irritating discharge, such as that of cancer. Oxide of zinc ointment may be used with the addition of carbolic acid, 5 per cent. An ointment containing thymol, 2 per cent., may also be used; and, in cases where there is great irritation, cocaine, 5—10 per cent., or morphia, 1 per cent., may be added.

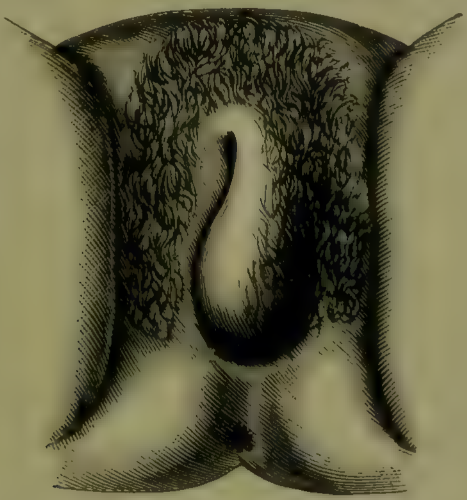
Fig. 268.—Cyst of Vulvo-vaginal Gland.

Gangrene of the Vulva occurs in cachectic children in the form of noma, and also occasionally appears in some forms of puerperal septicæmia, or in severe zymotic diseases. Sporadic cases in adults, of doubtful causation, have also been recorded.

Cystic Dilatation of the Vulvo-vaginal Glands arises from occlusion of the duct of the gland (the opening of which is situated just in front of the hymen), and is generally the consequence of vulvitis. A fluctuating swelling is thus formed, which may enlarge to the size of a small hen's-egg, lying behind the labium majus (Fig. 268). It contains a clear glairy fluid. The chief symptom is usually that of pain or inconvenience on coitus.

Treatment. — The best treatment is to shave the vulva, make an incision on the cutaneous side of the swelling, and dissect out the cyst, including the gland. The vessels at the base supplying it should be tied with chromic gut before division. The gap should be closed by silkworm-gut sutures. It is possible, though difficult, to maintain complete antisepsis by a dressing of antiseptic gauze sealed with collodion and iodoform.

This method sacrifices the gland. The only way to preserve its function is to make an incision on the mucous surface, and excise the superficial half of the cyst, leaving the deeper layers, and letting the wound heal by granulation. This method involves a longer process of healing.

INFLAMMATION AND ABSCESS OF THE VULVO-VAGINAL GLAND is commonly a sequel of gonorrhœa, but may arise from simple vulvitis, especially when combined with want of cleanliness. A cystic dilatation of the duct may also suppurate. An abscess arising from the gland itself occupies a deeper position than that resulting from a suppurating cyst of the duct. The *treatment* consists in rest, the application of antiseptic compresses, and free incision from the mucous surface as soon as fluctuation is discovered.

ABSCESS OF THE VULVA may arise from other causes than inflammation of the vulvo-vaginal gland, and then usually affects the whole tissue of one labium, not especially its lower part. The commonest exciting cause is violence or injury of some kind, but sometimes the causation is obscure. Irritative vaginal secretions or vulvitis may be the starting-point. Furuncles may also originate in the sebaceous glands of the labium, and extend to form small abscesses. In either case the *treatment* is evacuation as soon as pus has formed.

VARICOSE DILATATION OF THE VEINS OF THE VULVA is generally the result of pregnancy, but may occur apart from that condition, or persist afterwards. The *treatment* should generally be limited to bathing with cold water, administration of laxatives, and rest. Fatal hæmorrhage may occur from puncture of these veins by a sharp instrument, or rupture by a blow or kick. Rupture has even occurred in coitus, or in straining at stool. If the hæmorrhage is detected, it may always be arrested by pressure. If a localized varix causes much inconvenience, it may be excised.

HÆMATOMA, OR THROMBUS OF THE LABIUM, is chiefly of importance in relation to pregnancy and parturition, but may result from violence or puncture by a pointed instrument, even in the non-pregnant condition. Varicose veins greatly predispose to its occurrence. In non-puerperal cases it is rarely necessary to evacuate the swelling. This should not be done unless decomposition or suppuration occurs in it, or its size is so enormous that no progress is made in its absorption.

ERUPTIONS.—Of the eruptions which may occur about the vulva, as elsewhere, the most frequent are lichen, acne, furuncles, and especially *eczema*. Eczema of the vulva is often the source of extreme distress from the soreness or pruritus which it occasions. It usually commences on the outer surface of the labia majora, and extends to the adjoining skin of the thighs and abdomen as well as to the mucous membrane of the vulva. Vesicles are not often seen; but an excoriated, moist, weeping surface is produced. When chronic the disease causes loss of hair, and considerable thickening of the skin and mucous membrane. The point chiefly to be noted about eczema in this situation is its frequent association with the presence of sugar in the urine, often without any loss of flesh or general symptoms of diabetes sufficient to attract attention. The eruption is not solely due to local irritation from the urine, since, as Dr. Braxton Hicks has pointed out, eczema not unfrequently occurs in other parts of the body in the same cases. The glycosuria may be of sufficient amount to indicate true diabetes, or may be the unimportant glycosuria which occurs in plethoric elderly people.

General diet and regimen suitable to eczema in general are advisable, especially if there is no local exciting cause, and a tendency to eczema in other parts appears.

The following are the chief points to be observed as regards diet. Meat should be taken rather sparingly—fish and chicken, rather than beef. Soup and meat extracts should be avoided. Green vegetables should be taken abundantly. Jams, pastry, preserved fruit should be avoided, and sugar taken sparingly. All roots containing sugar should be avoided. Fresh fruit should be taken rather sparingly, and, in obstinate cases, may have to be discontinued. Alcohol, oatmeal, and vinegar should be avoided.

Eczema also occurs from the irritation of a leucorrhœal discharge, from incontinence of urine in gouty subjects, or from the excoriation consequent upon excess of fat.

When the urine is saccharine, constitutional *treatment* suitable to diabetes should be employed, and the genitals should be washed with water after micturition. The local and constitutional treatment is otherwise similar to that of eczema in other parts. In obstinate cases it may be necessary to modify the condition of the skin by brushing over it caustic fluids, as a solution of nitrate of silver (ʒj. ad ℥j.), strong carbolic acid, or a solution of caustic potash (ʒss. ad ℥j.), or by rubbing over it the solid nitrate of silver.

Kraurosis Vulvæ.—This title was first applied by Breisky, of Prague, to a condition in which atrophy is consequent upon or combined with inflammation, but in which the features of atrophy predominate. It occurs only after the age of forty, and in some recorded instances the uterine appendages had been removed.

The disease commences by the production of small reddish areas around the ostium vaginæ. They are depressed rather than elevated, and sensitive, rendering coitus painful or impossible. The skin and mucous membrane become thin and glossy, the normal folds of the vulva are lost, and the ostium vaginæ becomes very narrow. Eventually the whole vulva is involved, so that the labia minora are fused with the labia majora, and scarcely a trace of them can be seen. In some cases there is atrophy also of the mons veneris, with complete alopecia.

The disease is often preceded by vaginal catarrh and chronic pruritus, but there is no history of syphilis as an antecedent. Histologically there is evidence of hyperæmia. The epidermis is in some parts hardened, thickened, and hypertrophic; in other places thin and atrophic. The corium shows a similar difference; in some places the papillæ are infiltrated with round, inflammatory cells; in others they have shrunken and nearly disappeared. The latter condition appears to be the sequel of the former. At the margin of the disease, Orthman found a small-celled infiltration of the corium and flattening out of the papillæ.

Symptoms.—The most marked early symptom is the existence of over-sensitive areas, causing dyspareunia. Pruritus is present in the earlier stage in about a third of the cases, and generally there is a burning sensation, especially in micturition. Later, there is loss of sensation and general contraction.

Treatment.—As a palliative, carbolic lotion or lead lotion may be kept applied by pledgets of lint between the labia. When the part affected is circumscribed, excision has effected a cure; but sometimes the disease has recurred. The atrophy and contraction, if established, are incurable.

HYPERPLASIA OF THE CLITORIS is generally in whole or in part congenital. The hypertrophy, if of a degree calling for interference, is usually unconnected with masturbation, although masturbation often produces a certain amount of enlargement. If much inconvenience is caused, amputation of the organ may be called for. It may be carried out by the plastic method, and the cut edges united by sutures.

HYPERPLASIA OF THE NYMPHÆ.—The nymphæ may be elongated into long flaps, either congenitally or from the effect of masturbation. They may then form an impediment in coitus, or may become irritated from the contact of the clothes in walking. If, in a virgin, both clitoris and nymphæ are enlarged, so as to project visibly between the labia majora without separation of the thighs, masturbation in childhood may be suspected. The inference is stronger if the right nympha is specially elongated. Masturbation does not, however, necessarily produce any physical change whatever. If they appear to be a source of irritation, the hypertrophied nymphæ may be partially or wholly removed.

ELEPHANTIASIS OF THE VULVA is very rare except in Eastern countries. It generally commences in one labium majus, and may form an enormous pedunculated tumour. Elephantiasis proper is due to obstruction of lymphatic vessels by the *Filaria sanguinis hominis*. If the growth is pedunculated or localized, it may either be excised, and its vessels tied or twisted and the cut edges united by sutures, or it may be amputated by the galvanic écraseur, or by the knife of the benzoline cautery. The term elephantiasis has been used vaguely of other forms of hypertrophy, especially if associated with lymphatic varix. Some, probably most, of these are the sequel of syphilis. The hypertrophied structure should be excised if it causes inconvenience.

FIBROMATA may grow from the labia majora, or minora, or from the perineum. They may attain a considerable size and are often pedunculated. They may be softened by myxomatous degeneration. The name of molluscum fibrosum has been applied to such growths when pedunculated. Removal of the growths is easy.

LIPOMATA generally grow from the labia majora or mons veneris. They may distend the inguinal canal like a hernia. Very large tumours have been recorded.

HERNIA.—Inguinal hernia descends into the labium from above. It is rarer than femoral hernia in women; but in children it is less rare in proportion. An ovary or Fallopian tube may descend into a hernia and become adherent there. Congenital hernia of the ovary has been described as a malformation. But, in general, a body congenitally placed in the inguinal canal, or labium majus, turns out to be a testicle, often imperfect and without excretory duct, and the individual to be a male pseudo-hermaphrodite.

Very rare cases have been recorded of what has been termed a perineal hernia. It is of two varieties. In the first, the hernia distends the utero-vesical pouch of peritoneum and descends between the bladder and uterus, and by the side of the vagina into the labium. In the second, it distends the retro-uterine pouch of peritoneum and descends either into labium or perineum. The latter variety, if in the labium, is liable to be mistaken for a cyst of the vulvo-vaginal gland. This variety is more likely to contain ovary or tube.

Diagnosis.—Hernia is distinguished by its connection with the abdomen, by its receiving an impulse on coughing, by its resonance if it contains intestine, and by its being generally reducible.

HYDROCELE OF THE CANAL OF NUCK may occur from a persistent portion of the canal of Nuck getting shut off and distended with secretion, so as to form a cystic tumour. Or several separate portions may be distended, forming a series of cysts in a chain. Hydroceles occupy the upper or upper and middle part of the labium, the lower part being free, and are thus distinguished from a vulvo-vaginal cyst.

Treatment.—The hydrocele may be dissected out if it causes trouble, and the gap closed by sutures.

TUBERCULOSIS OF THE VULVA used to be considered very rare, but of late tubercle bacilli have been demonstrated in conditions not at first supposed to be tubercular, as, for instance, in a clitoris excised on account of so-called elephantiasis. Tuberculosis may either be secondary to a general tubercular infection, or may be primary in the vulva, and due to local infection, especially in prostitutes. It may occur alike in children and adults.

The starting-point in local tuberculosis is usually the neighbourhood of the clitoris, urethra, or posterior commissure. Single or multiple nodules are formed, which increase very slowly. After a time these break down to form a raised ulcer with ragged edges, exuding a serous fluid. There is less tendency to caseation than in most situations. If discrete ulcers are formed, they may run together to form an extensive area of tubercular granulations. The ulcers are often serpiginous, healing at one part and advancing at another. Clitoris and nymphæ are often enlarged and indurated. If the urethra is involved, its orifice may be replaced by a funnel-shaped ulcer. Ulceration is generally very slow, but in some cases there is a tendency to deep penetration of the tissues. Fistulæ may be formed into the rectum or deeply penetrate the perineal body.

Diagnosis.—In doubtful cases, an excised portion of tissue may show the characteristic structure of tubercle. Tubercular bacilli may be detected in the discharge or in section, or the discharge may be tested by inoculation on guinea-pigs.

Treatment.—If the ulcer is primary and limited it may be completely excised. Otherwise ulcers may be curetted, or the X-ray or Finsen-light treatment may be adopted.

SYPHILIS.—A primary chancre frequently occurs on the vulva, but often passes unnoticed, as its course is not prolonged, and the characteristic induration is less marked than in the male sex. If the chancre is situated on the nymphæ or at the fourchette it becomes indurated. If it is at the vaginal orifice the induration is not easily detected. In this case, the chancre may present the appearance of a superficial erosion, with a red surface exuding serous fluid, or of a raised papule of a dullish red colour, with loss of epithelium on the surface. If the chancre becomes inflamed, as from walking or uncleanliness, œdema and infiltration may extend around. The diagnosis is aided by small indurated glands in the groin.

Late Results of Syphilis.—As a sequel of syphilis, generally at least several years after the primary attack, often from six to twelve years, ulceration of the vulva may occur, combined with hypertrophy, the ulceration taking place chiefly in the indurated hypertrophied tissue. The clitoris, nymphæ, and vestibule are most frequently affected. In debilitated subjects deep and rapid ulceration may take place, causing extensive destruction of tissue and laying open the rectum. In general, however, the course is chronic, and the ulcers heal at one part and spread at another, as in tuberculosis.

Dr. Matthews Duncan* described, under the title of lupus of the vulva, a condition apart from tubercle, characterized by the association of hypertrophic nodules with ulceration. He distinguished lupus maximus, hypertrophic lupus, and lupus minimus. It has been generally considered that most of these conditions were the sequel of syphilis, but some may have been really tubercular. In some cases tuberculosis has been apparently combined with syphilitic ulceration. It must be considered at present undetermined whether such a thing exists at the vulva as chronic rodent ulcer or "esthiomène," which is not tubercular, syphilitic, or cancerous.

Treatment.—The nymphæ if affected should be completely excised, together with any other prominent hypertrophic masses. At the same time constitutional treatment for syphilis should be employed, such as the administration of liq. hydrarg. perchlor. ♏ lx.—lxxx. ter quotidie.

Chancroid, or soft chancre, is a local contagious ulcer, often multiple, and inoculable on the same individual, which hard chancre is not. It is generally met with in the lowest class of society in association with uncleanliness, and is transmitted chiefly by venereal infection. It is apt to lead to suppurating buboes in the groin. A characteristic streptobacillus, which is decolorized by Gram's method, is found in the pus cells and tissues. In the pus cells it occurs single, but in the tissues in chain form. In the form of *phagedænic chancroid*, which is very rare, the ulcer may become very destructive. The course of an ordinary chancroid is generally from two to three weeks. A mixed infection may occur in combination with syphilis. Then, after a few weeks, instead of healing, the ulcers become indurated and syphilis follows.

Diagnosis.—The edges of the ulcer are sharply cut, the base uneven and exuding thin purulent secretion. It begins to develop from twenty-four to forty-eight hours after contagion in the form of a small pustule.

Treatment.—The ulcer may be washed three times a day with solution of hydrogen peroxide or other antiseptic, sprinkled with iodoform powder and covered with iodoform gauze, the patient being kept in bed.

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* "Obstet. Trans.," vol. xxvii.

In case of rapid spread, cocaine should be applied or an anæsthetic given; and the surface cauterized with strong carbolic acid or nitric acid.

HERPES ZOSTER may affect the vulva in conjunction with the neighbouring part of the thigh. It is characterized by its being unilateral, limited to the distribution of one nerve, and consists of an eruption of vesicles which may become purulent. It is preceded by pain in the area of the nerve, and runs a course of about three weeks, uninfluenced by treatment.

WARTS AND CONDYLOMATA.—Condylomata on the vulva generally occur in the acuminated rather than in the flattened variety, and may form branching papillomata. Warts of similar appearance may be venereal without being syphilitic, and may arise out of gonorrhœa. Their growth is much promoted by uncleanliness. But a very exuberant proliferation of warts mostly occurs in syphilitic subjects. The warts may occur on the labia minora and majora and around the clitoris, and not unfrequently spread over the perineum, round the anus, and over the adjacent surfaces of the thighs. They consist of hypertrophy of the papillæ of the skin, covered with a thickened epithelium, but without any invasion of the stroma by epithelium. They are apt to grow very rapidly during pregnancy.

Treatment.—The warts should be thoroughly excised, and the bleeding checked by ligature of the vessels and pressure; or, if necessary, by the benzoline cautery or application of strong solution of perchloride of iron. In cases of extraordinary development they may be removed by the cautery. If there is any tendency to recurrence, caustic, such as pure formalin, should be applied as the warts reappear. A powder of equal parts of salicylic acid and calomel, or salicylic acid dissolved in collodion, may also be applied. If syphilis is present, constitutional treatment should be used in addition.

EPITHELIOMA is much less common than cancer of the cervix uteri, and occurs later in life. In the majority of cases, patients are over fifty years old. It commences most frequently about the clitoris, nymphæ, or inner surfaces of labia majora. In structure it is a typical squamous-celled epithelium, generally with abundant epithelial globes.

It is frequently the sequel of chronic eczema or dermatitis, which has produced excoriated patches. It commences as a papule, or elevation, with inelastic indurated base, often papillary on the surface. Later, the surface becomes ulcerated.

It may cause metastasis at the opposite side of the vulva by contact. Sometimes, after removal, when the vulva is affected by chronic dermatitis, fresh growths spring up at other excoriated patches and not at the cicatrix. Progress is not very rapid, but the glands in the groin become affected before long. If the growth reaches the mucous membrane, it spreads more rapidly.

Diagnosis.—There is more formation of thick inelastic base than in syphilis, a more papillary surface, and more tendency to bleed, though the latter is not very marked in the early stage. There is no tendency for the ulceration to heal at any part. The age of the patient will aid the diagnosis. In a doubtful case, a fragment may be removed for microscopic examination.

Treatment.—If the disease can be isolated, and there are no metastases which cannot be removed, it should be excised by the knife with a wide margin. The vessels are tied and remaining hæmorrhage arrested, and the gap closed, if possible, by uniting the edges with silkworm gut sutures. It is sometimes possible to remove the growth even if it has encroached upon the vagina. It is generally impracticable to maintain an antiseptic dressing, and, in this case, it is better to leave the wound entirely uncovered. It may be dusted with iodoform or traumatol powder. If any thickened lymphatic tracts or glands in the groin can be detected, they should be removed at the same time.

In inoperable cases, X-rays may be tried with more hope than in the case of cancer of the uterus.

CARCINOMA of the vulvo-vaginal gland has been recorded but is still more rare.

SARCOMA is also much more rare than epithelioma, but may occur in the young. A considerable proportion of cases recorded have been melanotic sarcoma, originating in moles or pigmented spots. The growth is generally highly malignant and recurs quickly.

RUPTURE OF THE PERINEUM in almost all cases occurs in parturition, although, in a few instances, it may be produced in the extraction *per vaginam* of a large tumour, such as a fibroid. Cases of rupture of the perineum may be divided into two great classes: first, incomplete ruptures, in which the sphincter ani is not divided; secondly, complete ruptures, in which the sphincter ani is divided, and therefore more or less of the recto-vaginal septum destroyed. In both cases the primary operation ought always to be performed at the time of the rupture, and is much easier than the secondary operation, since no freshening of surfaces is required. This primary operation will not, however, be considered here, since it is described in text-books of midwifery.

The effect of incomplete rupture of the perineum is to deprive the anterior vaginal wall in its lower part of the support which it normally receives from the perineal body (*see* Fig. 2, p. 5), and so to facilitate the production of prolapse of the vagina, and consequently of the uterus, when the causes exist, such as laborious occupation, or excessive abdominal tension, which favour descent. The use of the vagina in coitus may also be impaired, from the laxity at the outlet which is so produced. When the rupture is at all extensive, reaching up to, or nearly up to, the sphincter ani, it is desirable to operate for its cure without waiting for prolapse to be produced. The time for such operation, supposing the primary operation to have failed, or not to have been performed, should not be less than two months after delivery, so that the effects of the puerperal state may have completely passed away. It is also convenient if the infant can be weaned before the operation, that the patient may not have the disturbance of

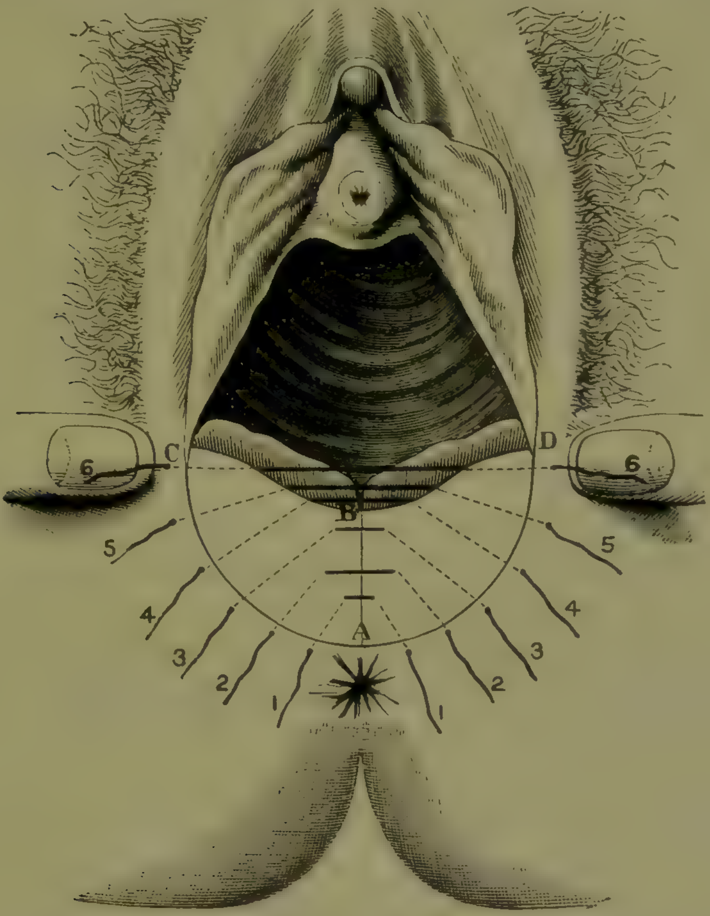

Fig. 269.—Operation for Restoration of Perineum.

suckling while the union is taking place; but this is not absolutely essential.

Operation for Incomplete Rupture of Perineum.—The following operation is suitable for cases in which the rupture is recent, and not complicated by prolapse of the uterus, considerable rectocele or cystocele, or extreme laxity of the vulval outlet. When any of those conditions exists, one of the operations described in Chapter VIII., p. 318, should be chosen.

The patient is placed in the lithotomy position, the thighs secured by leg-rests or by Clover's crutch.

The extent of surface to be freshened is indicated, to some extent, by the cicatrix left by the rupture. It is well, however, to go a little beyond the limits of this in all directions, especially up the median line of the vagina and toward the lower halves of the labia majora, both in order to secure, if possible, a perineal body somewhat longer and deeper than the original one, and to allow some margin, in case the surfaces do not unite completely up to the edges. To put the mucous membrane on a stretch, an assistant at each side places one or two fingers on the skin of the thigh and draws the vulva outwards (Fig. 269, p. 617). The skin just beneath A (Fig. 269), in front of the anus, may also be seized by a tenaculum and drawn downwards. If still the mucous membrane is not sufficiently on a stretch, from laxity of the vagina, the posterior vaginal wall, some distance above B, should be seized by a vulsellum and pushed upward.

Incisions are then made through the mucous membrane from B to A (Fig. 269), in the median line of the vagina, and from A to C and D through the junction of mucous membrane and skin. These should not be extended in the direction of C and D farther than the lower extremity of the nymphæ at the utmost. There are then two triangular flaps, A B C and A B D. These are to be dissected up from the apex A toward the base B C and B D, the corner of the mucous membrane at A being seized with dissecting forceps. The dissection should not be deeper than necessary; and, if it is done with the knife, the surfaces are more ready to unite. If, however, there is much tendency to bleed, scissors may be used. The apices of the flaps are then cut off with scissors, leaving an upturned border along B C and B D. When the surfaces are drawn together, these borders form a slightly elevated ridge toward the vagina, and if there is any failure of union just along the edge they fall over and cover it.

Silkworm gut sutures are then placed, as shown in the figure, by means of Hagedorn's needles of half-circle curve (*see* Fig. 64, p. 76). Another mode is to bury the sutures 1, 2, 3 in the tissues throughout their whole course. If, however, they are brought out in the centre for spaces alternately short and long, as shown in the figure, the surfaces are more easily brought into contact at all levels without undue tension. In passing sutures 4, 5, 6, the needle should be brought out precisely on the margin along which the border of mucous membrane B D is turned up from the vagina, not passing through the mucous membrane itself, and passed in again on the corresponding spot on the margin B C, to be brought out so as to include the skin of the perineum. The sutures are then tied in the order of the numbers from 1 to 6, care being taken that the surfaces are brought just sufficiently into apposition, and that no clots of blood are left between them. The bleeding, if any continues, is arrested by bringing the surfaces together, and, if they are properly united, there will be no secondary hæmorrhage, unless the sutures begin to cut through from excessive tension. The sutures may be left from seven to nine days.

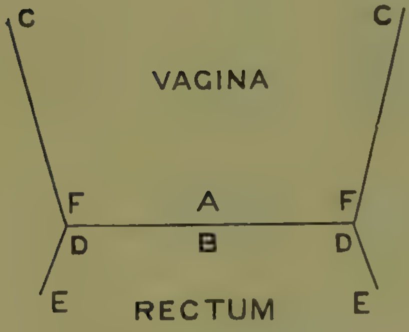

Fig. 270.—Flap-splitting Operation. Incisions.
(After LAWSON TAIT.)

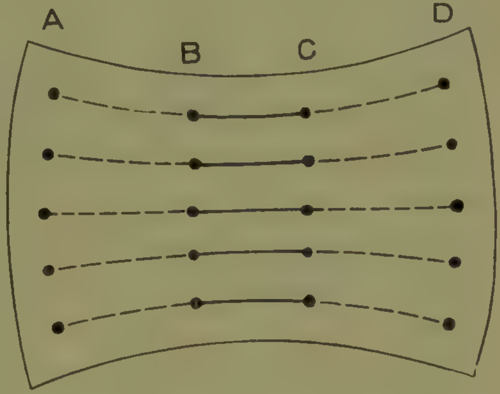

Fig. 271.—Flap-splitting Operation. Mode of placing Sutures.
(After LAWSON TAIT.)

Flap-splitting Operation.—An alternative operation for ruptured perineum is the flap-splitting operation introduced by Mr. Lawson Tait. A transverse incision F F is made with sharp-pointed scissors across the remaining perineum, or across the recto-vaginal septum, if the perineum is destroyed, and carried about half an inch deep. Incisions nearly at right angles are made from the ends of this, in the lines F C, D E. The length F C is 1-in., F E $\frac{1}{3}$-in. Tenaculum hooks are then placed at the points F F, and drawn upward and outward. Two other tenaculum hooks are placed at the points D D, and drawn downward and outward.

The raw surface is thus converted into the quadrangular shape shown in Fig. 271, the angles of the quadrangle being the points F F, D D, in Fig. 270. The mode of placing the sutures is shown in Fig. 271. The points of insertion and exit are within the margins of skin, and the sutures are brought out across the middle, B C. Other operators include the edges of the skin, and some bury the sutures completely. The sides of the quadrilateral in Fig. 271 are thus brought together in a longitudinal line. The idea of the operation is that the line of tear, originally longitudinal, has healed in a transverse cicatrix. A transverse incision is therefore made along the cicatrix, but brought together into a longitudinal union.

This operation has the advantage that it removes no tissue, can be performed very rapidly, and is very effective in restoring the recto-vaginal septum. It does not, however, make so long a perineum as the paring operation, and I do not consider that it restores the original situation of the parts so completely as may be done with the latter operation by a skilful operator. For the cicatrix is generally not a transverse line, but a surface; and it is only by removal of the cicatricial surface that the original relations can be restored.

The effect of complete rupture is, in addition, to destroy or impair the power of retaining the contents of the bowel. This may vary from complete incontinence of fæces to a diminished power of retaining flatus or liquid motions when the bowels are loose. The main object of operation in this case is to restore the functions of the sphincter, and the operation is a failure if this is not attained, however strong a perineum may be produced. When the sphincter ani is torn through, its two ends separate, and, instead of being a circle, it becomes nearly a straight line, in the position E F (Fig. 272). Thus, in such cases, the radiating folds of skin indicating the sphincter are seen at the lower margin only of the bowel orifice, and the sphincter itself can be felt by the finger under the skin as a straight or nearly straight ridge, the ends of which have retracted away somewhat from the edges of the cicatrix at E F. The most important point in the operation is so to regulate the freshening and placing of sutures that the ends of the sphincter are brought together again.

Operation for Complete Rupture of Perineum.—Supposing that the operation is to be performed in the afternoon, an aperient is given, not on the night before, but on the previous one. An enema is administered on the morning of the operation, and at the same time a dose of tincture of opium, 15 minims, is administered lest there be liquid fæces to soil the pared surfaces. At the time of operating, a sponge, tied by a tape, is passed just within the bowel, to prevent fæcal matter coming down. The thighs are then secured by leg-rests or Clover's crutch (*see* p. 80), and the fingers of assistants put the mucous membrane on the stretch by drawing the skin of the thigh outward near C and D (Fig. 272). A point B in the median line of the vagina, a sufficient distance above the apex of the rent in the septum, is taken, and an incision through the mucous membrane is made from B to G, and from G to E and F, along the edges of the septum, between the rectal mucous membrane and the cicatrix. Incisions are also made through the skin from E to C, and F to D, so that the freshened surface may extend somewhat beyond the limits of the cicatrix left by the rent; C and D not to be higher than the lower extremities of the nymphæ.

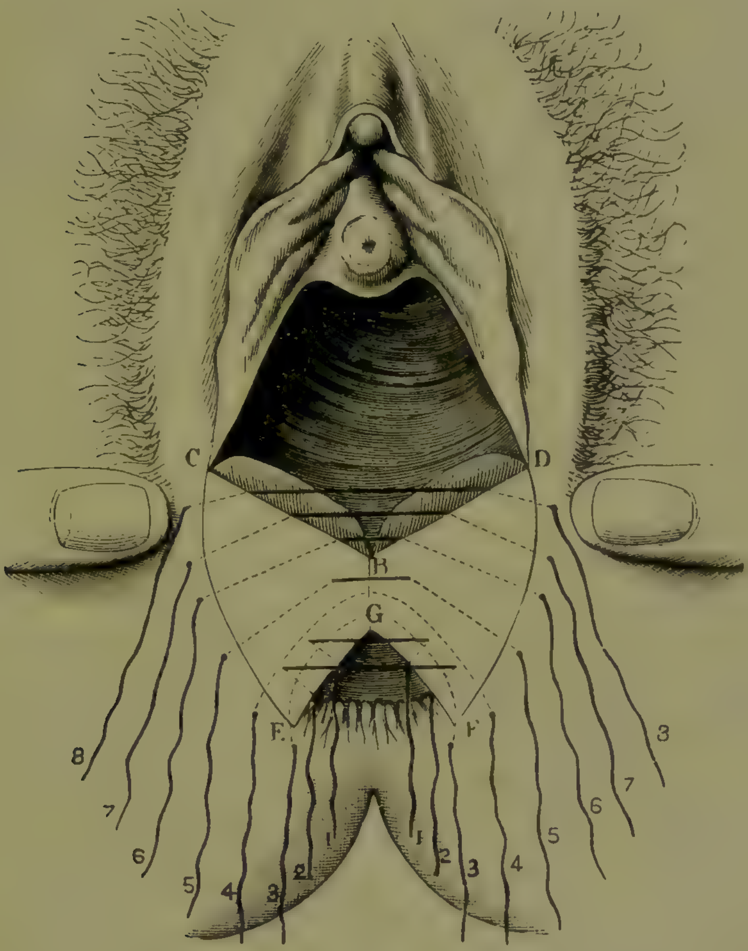

Fig. 272.—Operation for Complete Rupture of Perineum.
1, 2, Rectal sutures; 3—8, Perineal sutures.

The quadrilateral flap E G B C is then seized at E by dissecting forceps, and dissected up with the knife from the angle E, and afterwards from the angle G, towards the base B C. While this is done, the parts are kept on the stretch by an assistant drawing down the skin below E with a tenaculum. The flap is then cut away with scissors, except an upturned border, which is left along B C. The flap F G B D is treated in a similar manner. If, as is usual, the ends of the sphincter at E and F have retracted from the margins of the cicatrix, it is well to cut away with the scissors a narrow strip of rectal mucous membrane, generally somewhat everted, a short distance from E and F toward G, so as to bring the freshened surface up to the ends of the sphincter.

Sutures (*see* p. 621) are then applied in the following manner:—First, rectal sutures of chromic catgut, either two or three, according to the extent of rent in the septum, are applied. These are destined to be tied in the rectum, and left to be absorbed, the ends being cut short. They are best applied with Hagedorn's needle-holder and needle (Fig. 63, p. 76). The needle is passed in a little distance from the margin of the rent, and brought out almost at the very edge of the rectal mucous membrane, on the line G F. The needle is then threaded at the other end of the suture, and passed through in the same way from without inward, emerging on the margin E G.

The remaining sutures should be of stout fishing-gut. One or two sutures may be first passed completely round through the remnant of the septum, by means of a Hagedorn's needle, as shown in Fig. 272. The first of these (3, Fig. 272) is passed in somewhat behind and below the angle F, so as to take up, if possible, or at least go quite close to, the end of the divided sphincter, and is brought out in a similar position near E. Thus, when tightened, it brings together the ends of the sphincter, drawing it into a circle: but it often brings into apposition, not so much the freshened surfaces above as the unfreshened rectal mucous membrane. This serves as a barrier to keep out fæcal matter, while the next suture (4, Fig. 272) aids the rectal sutures in uniting the freshened surfaces. Another plan, which answers equally well, is to bring out suture 3, a little way from the margin of the recto-vaginal split, between the points of entrance of sutures 1 and 2, and insert it again at a corresponding point on the opposite side, to be passed from within outward. In a similar way, suture 4 is brought out a short distance below the angle G, and passed in again on the opposite side.

The remaining sutures are passed as shown in the figure (5—8, Fig. 272) by a Hagedorn's needle, in the same way as in the operation for incomplete rupture (*see* p. 617). The needle is passed in pretty close to the edge C E or F D, and is brought out (except in the case of suture 5, Fig. 272) on the line where the margin C B or D B is turned up. On the opposite side it is passed in a similar way from within outwards. The effect is, that, when the sutures are tightened, the margins B C, B D are turned up into a slight ridge toward the vagina, and afterwards fall over and cover any portion of the vaginal border which does not unite quite up to the edge. Suture 5 (Fig. 272) may either be buried throughout, or brought out for a very short space near the median line B G.

When all the sutures are in place, the sponge is removed from the rectum, and the rectal sutures are tied first. Care must be taken to draw up the whole of the slack in the centre, and bring the edges E G, F G, perfectly together. This will approximate the ends of the sphincter to a great extent, and the approximation is completed by tightening suture 3. The remaining sutures are then tied in the order of the numbers, care being taken to allow no clots or blood to remain between, and to tighten them just enough to bring the surfaces into contact. The ends of each perineal suture should be tied together, and left rather long, so as to be less likely to prick the skin. The bowels should not be confined too long after the operation. The plan which I usually adopt is to give a subcutaneous injection of morphia, gr. $\frac{1}{4}$, the evening of the operation, and a diet of milk only until the bowels have been opened. At three clear days an action of the bowels is obtained by a dose of an ounce of castor oil. Smaller doses of this, or some other aperient, are then given every evening to secure a daily action. Enemata should be avoided if possible, but may be necessary if a collection of fæces has formed in the rectum. Special care must be taken that no collection of hard fæces takes place for the first two or three days after removal of the sutures.

The perineal sutures are removed in seven or eight days. By this operation the anus is generally much more completely restored than by the use of quilled sutures, or the plan of making deep lateral incisions to relieve tension. If there is much resistance to bringing the surfaces together, the only thing required is to use more numerous sutures, so as to diminish the tension on each.

The *flap-splitting operation*, described at p. 619, may also be used for complete rupture of the perineum. In this case, the splitting is carried out in the remnant of the septum. Besides the perineal stitches, one, two, or three septal stitches may be used. These are carried from the edge of the vaginal mucous membrane to just within the rectal mucous membrane, and are tied on the vaginal side.

RECTO-VAGINAL FISTULA. — In some cases, by the primary operation after labour, only superficial union is secured, and a recto-vaginal fistula is left above the part united. The perineum resulting from the operations will generally be found to form only a thin bridge; and often the sphincter ani will not be effectively united. The best plan is then to cut through the bridge of union at the time of the operation, and then proceed as in the case of complete rupture. This is the only way to secure a firm and thick perineum, and is less likely to fail than an operation on the fistula alone.

In the case of a recto-vaginal fistula higher up, such as may result from a Zwancke's pessary ulcerating through, it may be preferable to pare the fistula and unite its edges. If the edges are thin, they should be split in the manner described in Chapter XIV. for the case of vesico-vaginal fistula, and a set of buried sutures of chromic catgut used, as well as the superficial ones, to be tied on the vaginal side. It is well at the operation thoroughly to stretch the sphincter ani, to facilitate the escape of flatus, and prevent its collecting and separating the united edges.

CHAPTER XIV.

DISEASES OF THE URETHRA AND BLADDER.

VASCULAR CARUNCLE OF THE URETHRA is a growth of connective tissue, springing from just within the orifice of the urethra, generally at its lower or lateral border. Its size may be from that of a pin's head up to that of a hazel nut, or more rarely that of a cherry, and it is frequently pedunculated. In most cases the growth is very abundantly supplied with vessels and nerves, covered by an extremely thin epithelium, so that it is excessively sensitive and readily bleeds. Its histological structure is therefore that of angioma. It is sometimes single, but not unfrequently there are a number of small growths extending some distance within the urethral orifice. The more sensitive variety of caruncle has a bright cherry-red colour, and the tendency to bleed is generally in proportion to the sensitiveness. It is usually so friable that it can scarcely be grasped by forceps. The less sensitive variety of caruncle may be in colour like the surrounding mucous membrane, and is not so friable.

The *causation* is obscure, but the growth may sometimes originate in inflammation of the vulva and urethra; any cause of passive hyperæmia also tends to promote it. It is more common in married women, but is found not very unfrequently even in young virgins, and is not rare in the old. The *symptoms* are generally pain on micturition, which is often extreme, and excessive tenderness to any sort of contact, so that coitus is usually impossible or very painful, and even walking may give distress. Hence it is always desirable to examine visually the orifice of the urethra when great hyperæsthesia at the vulval outlet is found on digital examination. Sometimes bleeding occurs in micturition or at other times. Frequently severe hysterical symptoms are the result of the affection, and the mind sometimes becomes affected by serious depression. The *treatment* is to administer an anæsthetic, and remove the growth by the benzoline or actual cautery. Lead lotion, with the addition of opium or morphia, may afterwards be applied. If the growths are sessile they should be destroyed by cautery. When they extend up the urethra, Mr. Bryant's urethral speculum dilator of ivory (Fig. 52, p. 64) may be used with great advantage, both to expose them and to allow convenient access. The use of the cautery appears to be the most effectual means of guarding against recurrence of the caruncle, to which there is a strong tendency.

Granular inflammation of the urethral outlet, or extending some distance up the urethral canal, sometimes persists after removal of a caruncle, or may exist independently of any caruncle, especially in old women. The surface is then intensely red, may have the same extreme sensitiveness as a caruncle, and often readily bleeds. This condition may be treated by the application, with the aid of Playfair's probe (Fig. 119, p. 209), of equal parts of carbolic acid and glycerine, or a strong solution of nitrate of silver (gr. xl.—lx. ad ℥j.), or by the repeated application of the undiluted liquor plumbi subacetatis at intervals of two or three days.

URETHRITIS.—Acute urethritis is generally gonorrhœal in origin. The lining of the urethra secretes pus, and a drop or two may be squeezed from the urethra on examination. The infection of gonorrhœa is apt to linger long in this situation, especially in Skene's glands and their ducts. Urethritis may also arise from septic micrococci and other microbes, especially in conjunction with a cystitis, due to the same cause. Slighter forms of irritation and inflammation of the urethra are produced by an excess of uric acid and other toxins in the urine. The gouty temperament is supposed to predispose not only to these, but to infective inflammation, due to microbes other than gonorrhœal.

Symptoms and Diagnosis.—The symptoms consist of smarting or scalding on micturition; generally without vesical tenesmus, unless there is some cystitis in addition. The diagnosis of gonorrhœa is made in squeezing a drop or two of pus from the urethra, together with the general signs of gonorrhœa already described (*see* p. 176).

Treatment.—In all cases alcohol should be avoided, diet should be light, and the urine kept diluted by drinking plenty of liquid. In the case of gonorrhœa, the general treatment of gonorrhœal infection may be sufficient (*see* p. 599).

If the urethral symptoms are prominent or prolonged, sandalwood oil, sanmetto, copaiba, or urotropin, should be administered. In chronic cases, especially if the mucous membrane is granular, a Playfair's probe may be wrapped very finely with cotton-wool and applications made once in two or three days to the lining of the urethra with solution of nitrate of silver, gr. x.—xx. ad ℥j., or protargol, gr. xx—xl. ad ℥j. Ten per cent. solution of cocain may be applied previously.

PROLAPSE OF URETHRAL MUCOUS MEMBRANE with hyperplasia may occur in children or adults. If the swelling so produced is highly sensitive, and causes dysuria, it may be excised with scissors, and the urethral mucous membrane stitched to that of the vestibule.

STRICTURE OF THE URETHRA is very rare comparatively in the female sex. It arises from urethritis, generally due to gonorrhœa. It may be cured by dilatation with graduated bougies.

DILATATION OF URETHRA.—The urethra may become dilated from coitus *per urethram* in cases of vaginal atresia, or from the introduction of foreign bodies. Dilatation may exist without any inconvenience. For cases in which some incontinence of urine is produced, various operations have been performed. The simplest consists in cauterizing a longitudinal strip of mucous membrane by the galvanic cautery through a speculum with a lateral slit, as Bryant's urethral speculum (Fig. 52, p. 64).

URETHROCELE AND URETHRAL DIVERTICULA. — A cyst communicating with the urethra may form a swelling which presents at the vaginal outlet, causes pain and tenderness, and forms an obstacle to coitus. The urine stagnates in the pouch, and becomes decomposed. Hence arises inflammation, sometimes suppuration, of the walls of the pouch, and the mixed urine and secretion retained in it may become offensive, the more so the smaller is the opening.

One of two conditions may exist, both of which are mainly due to pregnancy and parturition—(1) urethrocele, in which the urethra is itself dilated into a pouch; (2) a urethral diverticulum which arises through a cyst bursting into the urethra, and generally communicates with it by a small opening. In the former case, a large sound in the urethra can be passed freely into the pouch at any point; in the latter there is only one point of entrance (or sometimes two), and frequently only a small sound can be passed through the opening. A urethrocele appears to arise from an injury to the floor of the urethra in the first instance, followed by stretching. The cyst which gives rise to the urethral diverticulum may have various origins. It may be a retention cyst from a urethral gland, a sac arising from an abscess, or from a small hæmatoma breaking down into an abscess. In some cases fat has been discharged from the cyst, and the cyst has been supposed to be a congenital dermoid inclusion cyst.

Treatment.—In urethrocele, the redundant portion should be excised, the edges united by silver or fishing-gut sutures, and a self-retaining catheter kept in the bladder for a week or two. Emmet, however, treated urethrocele by making a button-hole opening, stitching the vaginal to the urethral mucous membrane, and irrigating through the urethra till the sac had contracted.

In the case of a urethral diverticulum, the sac should be dissected out, with the aid of a sound in the urethra, and the opening closed as before by silver or silkworm-gut sutures. A self-retaining catheter should be used, the best form, in both cases, being that variety of Skene's catheter in which the bulbous end which retains the instrument has two large openings. Some recommend that when cystitis exists the opening in the vagina should only be partially closed by sutures, so as to allow drainage of the sac.

CYSTITIS.

Causation.—The severer forms of cystitis are due to microbic infection. Besides the ordinary micrococci of suppuration, and tubercle bacilli, various others are recorded as the cause of bladder inflammation. The one most frequently present is said to be the colon bacillus. This may enter the bladder from the kidneys with the urine, by the urethra, or through the walls of adherent intestine. Gonorrhœa may spread to the bladder and set up cystitis either in an acute attack, or in some slight exacerbation of a chronic or latent affection; especially when the tissues have been damaged as in parturition. As in other situations, the gonococcus promotes the invasion of other pyogenic microbes.

The proteus of Hansen has been found, and is said to cause very severe cystitis, and to decompose urea, and render the urine highly alkaline. Of the other microbes, the staphylococci also decompose urea and render the urine alkaline. The bacillus coli, tubercular bacillus, and *Streptococcus pyogenes* do not;

and thus cystitis dependent upon these microbes coexists with acid urine.

A frequent cause of cystitis is the use of the catheter. Microbes may be carried into the bladder by the catheter if not sterilized, or from the vulva by its means, if the neighbourhood of the meatus is not thoroughly disinfected. Even with the utmost precautions a prolonged use of the catheter is followed sooner or later by cystitis. This may be due to the small quantity of air which may be conveyed by the catheter. The access of air to the field of an operation is found practically not to convey pathogenic microbes, or not too many for the tissues to dispose of. Air contains, however, plenty of saprophytic germs, and these may multiply in the urine and eventually affect the bladder walls, since other than the ordinary pyogenic cocci can produce cystitis.

Infection from other forms of inflammation besides gonorrhœa may spread from the vulva along the urethra to the bladder. It may also reach the bladder from inflamed tissues in the vicinity, as from cellulitis spreading around the bladder.

An abscess in the vicinity may open into the bladder, and leave a sinus which keeps up a constant supply of pyogenic cocci. Microbes may also reach the bladder by being excreted through the kidneys: or the kidney itself may be the source of infection, as in tuberculosis or pyelitis.

To produce cystitis, microbes must not only be present in the urine, but invade the mucous membrane. Their invasion is promoted by any causes which damage the vitality of the tissue. Among such causes are the effect of cold, zymotic diseases, traumatic effects, as from parturition or operations; venous congestion from any general or local cause, displacements of the bladder, pressure on the bladder by tumours in the vicinity, the presence of calculi or foreign bodies, the presence in the urine of irritating substances, either toxins produced in the body or drugs being excreted. Some of these causes can produce minor degrees of inflammation without any microbes; and congestion, which may promote the occurrence of inflammation, results also, in sympathy with the uterus and ovaries, from menstruation, sexual excess, or sexual excitement.

Pathological Anatomy.—The inflammation varies in degree according to the virulence of the microbe concerned, and may be general, or circumscribed, generally to the neighbourhood of the trigone. The mucous membrane is swollen, and some of its epithelium becomes detached. Hæmorrhage may take place in the acute stage and ecchymoses and erosions form. In very severe cases the mucous membrane may slough and be discharged through the urethra. Inflammation may extend beyond the mucous membrane and produce abscesses. In chronic cases the muscular wall becomes hypertrophied, and the capacity of the bladder reduced.

In severe cases the urine contains pus mixed with thick ropy mucus, and may contain also blood. In slighter cases there is an excess of mucus with little or no pus. Bladder epithelium is found in the urine.

Results and Symptoms.—The main symptom is frequent and painful micturition. The pain is greatest at the end of micturition when the bladder walls come into contact. In severe cases there may be constant burning pain referred to the bladder, and it may be necessary to urinate every few minutes by day and night. In milder cases urination may be necessary only two or three times in the night, and every hour or two during the day. The chief risk is the extension of inflammation to the kidneys, and the production of pyelitis or suppuration of the kidneys.

Diagnosis.—From irritability of the bladder due to reflex influence from the uterus and ovaries, or inflammation outside it, cystitis is distinguished by the changes in the urine. Except in very slight cases, pus is present, and, in consequence, albumen. Mucus is always in excess. Offensive ammoniacal urine is a proof of cystitis, but cystitis may coexist with an acid inoffensive urine, according to the kind of microbes present. The microbes may be investigated by microscopic examination and cultivation.

Inflammation of the kidney, such as tubercular inflammation, sometimes causes a vesical tenesmus almost as great as cystitis. It is distinguished by the deposit from the urine consisting of pus only, not mucus and pus combined. In cystitis the bladder is found to be tender on bimanual examination.

In doubtful cases, the interior of the bladder may be examined by the cystoscope, or, preferably, by Kelly's urethral speculum. It is not generally advisable to use a ureteral catheter in the presence of infective cystitis. But, if cystitis appears to be absent, and a purulent discharge to come from the kidneys, the ureteral catheter will allow the secretion of each kidney to be collected separately.

Treatment.—In acute cases, the patient should be kept in bed on light diet, chiefly milk and starch, and alcohol should be avoided. Abundance of liquid should be taken to keep the urine diluted. If the urine is acid, citrate or acetate of potash should be given to diminish its acidity, but not carried far enough to render it alkaline. Hot vaginal douches and hot hip-baths tend to diminish pain.

In cystitis with alkaline ammoniacal urine, drugs are more efficacious in producing a rapid cure than when the urine is acid. Benzoic acid* has the greatest power of rendering the urine acid. Urotropin is also useful. When the urine is acid, urotropin may be given in doses of from 7 to 10 grains, or salol in doses of 10 grains, three times a day. Urotropin, however, in the larger doses sometimes increases the vesical tenesmus. In the more chronic stage, oil of sandalwood or sanmetto may be given, or urotropin continued for a long time in small doses.

If the inflammation does not subside in from one to three weeks, or as soon as the more acute symptoms have passed off, cure is accelerated by washing out the bladder with mild antiseptics. Even in the acute stage, morphia may be injected into the bladder, in the absence of ulceration, in doses of from one-half to one grain.

For washing out the bladder the best apparatus is a large glass funnel attached to a piece of rubber tubing about three feet long, fitted to a Skene's catheter of smaller size than that shown in Fig. 266, p. 603, and having a spring clip just above the catheter. The whole should be sterilized by boiling. The funnel is filled, and a little fluid allowed to escape by opening the clip, and then the catheter is passed into the bladder. The bulbous end of the Skene's catheter only just entering the bladder, cannot press against or irritate the walls. By raising the funnel a little, from two to four ounces only of fluid are allowed to enter the bladder. When the catheter is lowered, the fluid flows back, and is poured away by tilting the funnel. This process is repeated several times, until the fluid returns quite clear.

The least irritating fluid is Thompson's fluid,† diluted with from eight to twelve parts of sterilized water. Boric acid solution (2 per cent.) may also be used; and, if these fail, formalin (1 in 3,000), or perchloride of mercury (1 in 10,000–20,000) in normal saline solution (gr. 60 ad Oj.), or protargol in water (1 to 500–1,000), or nitrate of silver in distilled water (1 to 1,000–2,000).

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* Acid. benzoic. gr. x., boracis gr. xv., syrup. aurant. ʒj., mucilag. acaciæ ℥j. aq. ad Oj.—ter quotidie.

† Borax ʒss., glycerine ʒij., water ℥ij.

In obstinate cases the interior of the bladder should be inspected with Kelly's speculum; and any localized patches of inflammation may be touched with nitrate of silver, 2 to 3 per cent. Even in chronic cases restriction of diet to milk and starch is an aid to the cure.

Careful search should be made for any cause outside the bladder, such as abscess, kidney disease, or tumour, keeping up the inflammation.

If other means fail, the bladder has been drained for some weeks by cutting a button-hole opening in it from the vagina, and placing in it a short tube with flanges to prevent its closing. When the tube is removed, the opening generally closes spontaneously, or it may be closed by operation as a fistula. This means should not be used in cases in which the main cause of symptoms is neurosis. In such a case, I have known repeated operations by expert operators fail to close the fistula, until a great part of the base of the bladder had been cut away. A milder means is to use for a time the Skene's self-retaining catheter with a tube to drain the bladder into a vessel.

TUBERCULOSIS of the bladder is often associated with that of the kidney and ureters. The disease may begin either in the bladder or the kidney, generally the latter. In the bladder miliary tubercle is first deposited, and then superficial ulcers are formed, followed by general cystitis. In the later stage ulceration may lead to perforations into rectum, vagina, or fistulous openings in the perineum or above the pubes. Tubercle of the Fallopian tubes and uterus may be associated.

Diagnosis.—In the early stage tubercle bacilli may be found in the urine, but not when pus is abundant. The ureters may sometimes be felt as thick cords. The bladder may be inspected by Kelly's speculum, the ulcers seen, and a scraping taken from them for investigation.

Treatment.—When the bladder affection is the main element in the case, the ulcers may be curetted; and from time to time from two to four drachms of iodoform emulsion, 10 per cent., may be injected into the bladder and allowed to remain. Urotropin or salol may also be given internally.

CALCULUS AND FOREIGN BODIES.—A calculus in the bladder is very rare in women as compared with men; because a calculus, forming first in the kidney, generally escapes by the urethra soon after its arrival in the bladder owing to the relative shortness of that canal. Occasionally, however, a calculus may become impacted in the urethra. In a prolapse of the uterus with cystocele, which is never returned within the body, this facility of escape is abolished. In such a case I have found the bladder completely filled with large facetted calculi, which were removed by vaginal lithotomy.

When a foreign body is present, calculi may be formed secondarily. For cystitis is set up, the urine decomposes, phosphatic deposits are formed around the foreign body, and other calculi may form, and their escape be prevented by the foreign body.

Foreign bodies of various sorts may be introduced by neurotic or hysterical women. The end of a catheter has been known to be broken off and left. Silk ligatures or knots may find their way into the bladder after an operation. A neglected pessary, especially a Zwancke's pessary, may ulcerate into the bladder. The escape of a calculus may also be prevented by pouching of the bladder, stricture of the urethra, or the presence of a tumour.

Diagnosis is easily made by the bladder sound. It may be completed, if necessary, by dilatation of the urethra, and examination with Kelly's speculum or the finger.

Treatment.—A small calculus is easily removed through the dilated urethra with the aid of lithotrity if required. If there is a foreign body or calculus of large size, median vaginal lithotomy should be performed, and the opening closed at once by sutures. In rare cases of very severe inflammation, it may be desirable to leave a part open for a time for drainage.

TUMOURS.—Tumours of the bladder are rarer in women than in men, and the majority of them, 80 per cent. or more, are malignant. The most usual situations are the trigone, and near the orifices of the ureters.

The most frequent innocent tumours consist of papilloma or fibro-papilloma. They are more often sessile than pedunculated. They may have long tufts which float in the urine, and may be carried into and nipped in the urethra, thus causing distress. A papilloma may have a malignant base. Whether malignant or not, its prominent symptom is hæmorrhage.

Myxoma has been observed in young children. The growth generally begins at the neck of the bladder, and is often polypoid and multiple. It is soft, like a nasal polypus, and grows rapidly.

Fibroma occurs in adults. It originates deeply in the bladder wall, but may form a pedunculated tumour. It is very rare.

Myoma arising in the muscular wall, and *sarcoma*, are both rare. The latter occurs in the young.

Carcinoma may be either epithelial or adenomatous. The tumour is generally a round mass, circumscribed, with a broad base. The surface may be papillary or ulcerated. This constitutes about 80 per cent. of all bladder tumours. It generally occurs after the age of forty.

Adenoma and *dermoid cysts* have also been found in the bladder.

Results and Symptoms.—Hæmaturia is the most constant symptom in all forms of tumour, but especially in cancer. Pain is not an early symptom, and is generally due to cystitis. The bleeding is often copious; the proportion of blood in the urine varies, and is greatest at the end of micturition. Even a non-malignant tumour may cause death by hæmorrhage or by setting up cystitis, and spread of inflammation to the kidneys.

Diagnosis.—A mass or induration, with tenderness, at the base of the bladder may often be felt bimanually. Small polypoid tumours can only be verified after dilatation of the urethra, and examination with Kelly's speculum, the cystoscope, or the finger.

Treatment.—Small pedunculated growths may be removed through the urethra by the galvanic or ordinary écraseur. A growth on a broad base should be always looked upon as probably malignant. If it is not fixed by infiltration, and if it can be isolated, it should be removed, with resection of the bladder wall corresponding. According to the position of the growth, this may be done from the vagina, or by supra-pubic lithotomy. If an extensive operation is required, the latter is preferable. The whole bladder has been removed for cancer, the ureters being turned into the vagina.

In inoperable cases, if there is severe cystitis, or the urethra gets blocked by clots, it may be advisable to make a button-hole opening from the vagina for drainage, and stitch the vaginal mucous membrane to that of the bladder, to prevent the opening closing. The patient may wear the urinal described later on (p. 644).

FISTULA.—The following are the chief varieties of fistulæ which may exist in relation to the bladder, ureters, and urethra:—(*a*) urethro-vaginal; (*b*) vesico-vaginal; (*c*) vesico-uterine; (*d*) uretero-vaginal.

Causation.—In former days fistulæ occurred with comparative frequency as the result of prolonged labour, causing sloughing of the bladder wall from prolonged pressure between the fœtal head and the pubes. In these cases the urine only begins to escape after an interval of several days from delivery. Nowadays they are rarely seen, in consequence of the general practice of giving earlier assistance to delivery by forceps.

The bladder may be actually torn at the time of delivery by instruments, or the cranial bones after craniotomy, in cases of extreme pelvic contraction; but this is very rare. In such cases the urine begins to run away immediately from the time of labour.

Vesico-vaginal fistulæ may result from injury to the bladder in an operation, especially in vaginal hysterectomy or abdominal pan-hysterectomy. Uretero-vaginal fistulæ may result from similar operations or the removal of a broad ligament tumour, or an ovarian tumour which has burrowed deeply into the broad ligament. The ureter may be injured, or a piece of it may be cut out, or its wall may slough and give way, after an interval of several days, from interference with its vascular supply.

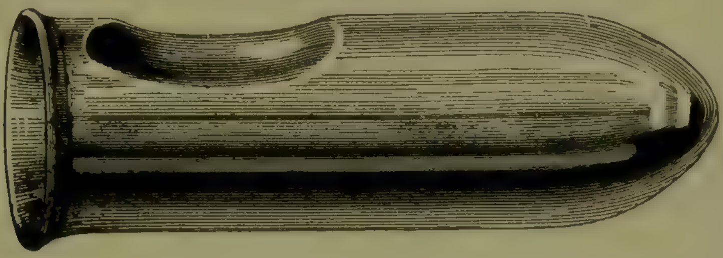

Fig. 273.—Sims' Vaginal Dilator.

Diagnosis.—The incontinence of urine due to a fistula differs from that due to other causes in that the flow is continuous; and thus there is always a urinous smell about the patient and her clothing. In case of doubt, when a fistula is very minute, or when the fistula is vesico-uterine, sterilized milk and water, or other coloured fluid, should be injected into the bladder, and its escape watched through a speculum. In a uretero-vaginal fistula about one-half of the urine will be passed from the bladder in the ordinary way, and one-half run away.

Treatment.—*Preparation for operation.*—The vagina, vulva, and surrounding parts will often be inflamed and excoriated by irritation from the urine which decomposes in the vagina. Urotropin should be administered to render the urine somewhat antiseptic, and frequent vaginal douches with a weak antiseptic should be used. The skin around the vulva may be protected by an ointment such as lano-creolin.

Sometimes the vagina is contracted from the effect of extensive sloughing, and the fistula may be bound down to the pubes or other parts. In these cases preliminary dilatation should be performed. Incisions may be made through the most rigid and prominent bands, and the vagina then dilated by a dilator of glass or vulcanite. Either Sims' dilator may be used (Fig. 273, p. 635), or Hart and Barbour's (Fig. 274), which allows better drainage of the top of the vagina. Either instrument should be cylindrical up to its rounded extremity, not conical, as they are sometimes made. The conical shape promotes the forcing out of the instrument by vaginal contraction. The dilator is kept in place by a T bandage.

Sometimes, when the fistula is very closely fixed to the pubes, it is even necessary, as a preliminary measure, to dilate the urethra, and incise constricting bands from the bladder side. This may generally be done immediately before the operation.

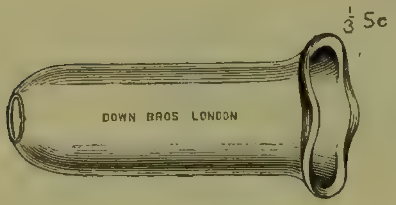

Fig. 274.—Hart and Barbour's Vaginal Dilator.

Operation for vesico-vaginal fistula.—For most plastic operations no material for suture is preferable to silkworm gut; and this may be used for vesico-vaginal fistula. But, in this particular operation, there is some advantage in using fine silver wire. The wire being simply bent over and twisted, not pulled, there is greater certainty that the edges of the wound are brought together with the minimum amount of tension. Also the sutures when in place hold the tissues together by the stiffness of the wire, not by a tension which is equal throughout the loop. Again, if it is found that the union is not quite close enough, and that there is leakage between the edges, the sutures are easily tightened by twisting the wires a little more.

The operation may be performed with the patient either in Sims' semi-prone position or in the lithotomy or exaggerated lithotomy position (Fig. 68, p. 80). The latter is generally preferable, if the cervix can be drawn down to the vulval outlet with vulsella, and the anterior vaginal wall descends also: for the fistula is thus practically brought to the surface, and is easily accessible. A bladder sound passed into the urethra (*see* Fig. 276, p. 638) often aids in bringing the fistula within easy reach. A Sims' speculum with a short blade (Fig. 37, p. 51) is used, or the vulsella fixed on the cervix may sufficiently retract the perineum, without any speculum. The sides of the vulva are held apart by vulsella (Fig. 219, p. 432) or the fingers of assistants.

In some cases the fistula is fixed up by bands of adhesion, and will not descend with the cervix when that is drawn down. It may then be preferable to operate with the uterus *in situ* and the patient in the semi-prone position, the perineum being retracted by a Sims' speculum, having a longer blade, or the diverging blades as in Fig. 37, p. 51.

If the edges of the fistula are fairly thick, they may be freshened in a bevelled shape, so that little or none of the bladder mucous membrane is removed, but more of the vaginal, and the freshened surfaces converge toward the bladder. In this way a wider surface for union is obtained. The edge of the fistula is seized with a sharp hook (Fig. 35, p. 49). The paring may be done by a narrow-bladed scalpel, which is made to transfix the edge, or by a narrow-bladed knife mounted in a long handle, which is convenient when the fistula cannot be drawn to the outside. If, however, the edges of the fistula are difficult to reach, a very convenient instrument for paring them is Emmet's scissors (Fig. 275), the blades of which are curved in a plane inclined diagonally to the handles. It is a shape not quite easy to understand from the figure; the blades being strongly concave toward the eye, as there depicted. By its means the edge can be cut off in a continuous strip round the whole, or a great part, of the margin of the fistula.

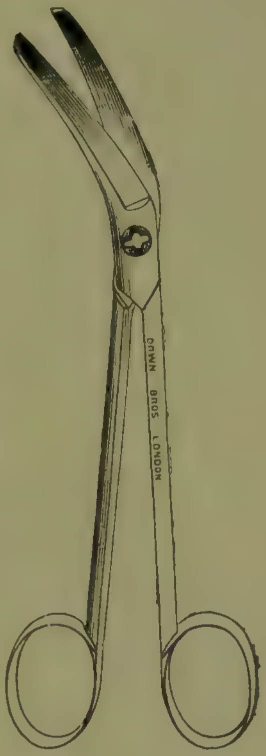

Fig. 275.—Emmet's Scissors for Vesico-vaginal Fistula.

The method of Simon, of Heidelberg, was to pare the edges of the fistula by an incision vertical to the surface, and not specially spare the bladder mucous membrane. The reason for sparing the bladder mucous membrane is that it bleeds more freely when incised than that of the vagina, and thus the field of view becomes more obscured by the blood. But in some cases, especially when it tends to bulge through the fistula into the vagina, a wider surface for union can be obtained by including it in the freshening.

The edges are to be brought together in a transverse, longitudinal, or oblique line, in whichever way they come together most naturally. A transverse line of union as shown in Fig. 276 is preferable, if the circumstances allow it, because then the transverse stretching of the vagina, such as is produced by a speculum introduced for removal of the sutures, does not tend to separate the edges. Moreover, in the case of a very large fistula, the vagina is not narrowed, but only shortened, which is of comparatively little consequence.

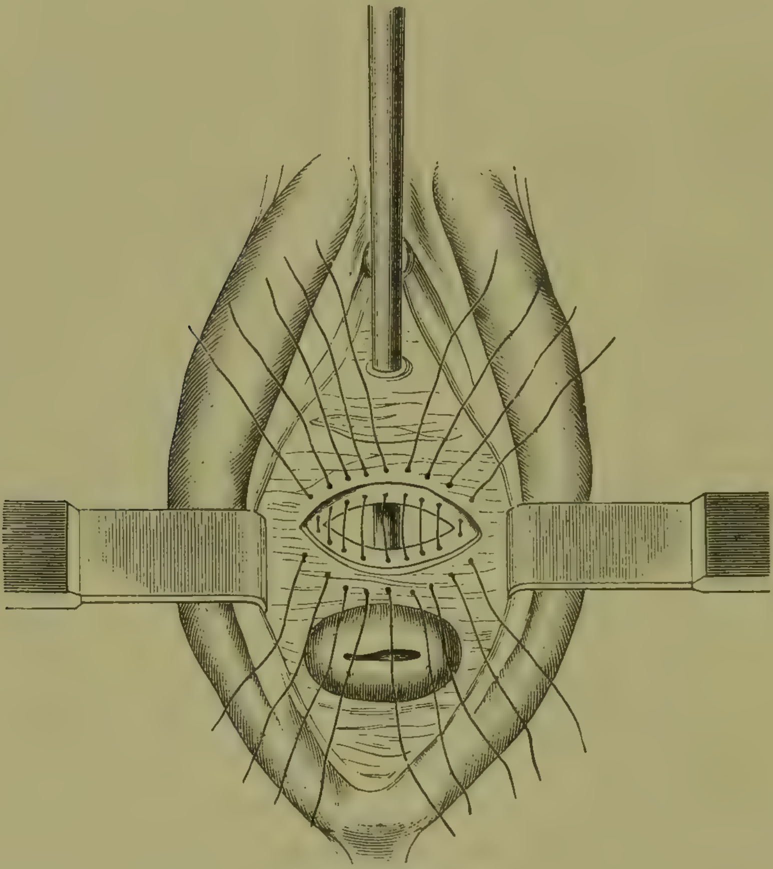

Fig. 276.—Operation for Vesico-vaginal Fistula. The Sutures after Introduction.

(After Simon.)

If, in the case of a large fistula, a ureter opens on the edge, the ureter must be slit up toward the bladder, otherwise the urine escaping between the approximated surfaces will prevent union.

The sutures should be numerous, as shown in Fig. 276, about eight to the inch. For passing them, a Hagedorn's needle-holder and small Hagedorn's needle (Figs. 63, 64, p. 76) may be used. If the fistula is brought to or near the surface, as in Fig. 276, the form of holder shown in Fig. 63 answers, whether the line of union is longitudinal, oblique, or transverse. If it is transverse, the needles are passed from the direction of the urethra toward that of the cervix, or from above downwards, in the position of the parts at the time of operation. If, however, the operation is performed with the patient in the semi-prone condition, and the fistula within the vagina, and if the line of union is transverse, another form of Hagedorn's needle-holder should be used, in which the stem is longer and the catch is oblique, so that, when the needle is seized, its plane is oblique, at an angle of 45°, to the stem. Then, by inclining the stem obliquely, the handle toward the operator's left, the sutures can easily be passed from the direction of the urethra toward that of the cervix.

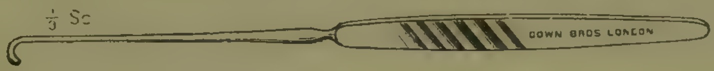

Fig. 277.—Small Blunt Hook for Operation for Vesico-vaginal Fistula.

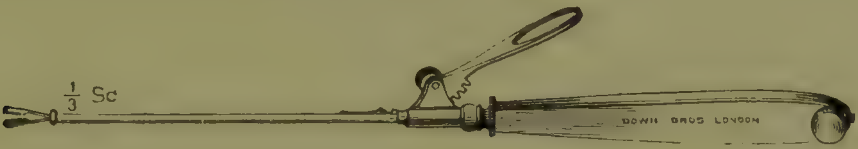

Fig. 278.—ARBUTHNOT LANE'S Needle-holder.

The small blunt hook shown in Fig. 277 is used as a counter-support to facilitate the exit of the needle, especially when the operation is performed with the fistula high in the vagina.

Another convenient form of needle-holder is that of Arbuthnot Lane (Fig. 278), intended especially for the operation on cleft palate. It is used with the small needles shown in Fig. 279.

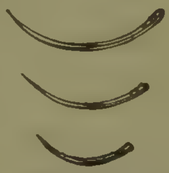

Fig. 279. ARBUTHNOT LANE'S Needles.

The entrance and exit of the sutures should be a short distance from the edge of the vaginal mucous membrane, as shown in Fig. 276, p. 638. They should be brought out, and passed in again, on the raw surfaces just within the unpared bladder mucous membrane. Thus, when the sutures are tightened, they are quite buried from the bladder side, and are not liable to become coated with phosphatic deposit, if there should be any cystitis, or the urine should become alkaline.

If the fistula is brought to the surface, the simplest way of twisting a suture is to take one end between the finger and thumb of each hand, cross them over the line of union, pull them till the edges are just in contact without too great tension, and twist them in this position by rotating the ends. Emmet and some other authorities made a great point of "shouldering" the suture before twisting, that is, when it is drawn tight enough to bring the edges together, to bend the wire, with a fine pair of forceps, at its point of exit, parallel to the mucous membrane, and then bend it again vertical to the mucous membrane immediately over the line of union. The other end having been treated in the same way, the two ends, now parallel and close together, are seized with a pair of suture forceps (Fig. 280) and twisted, the two ends having been slipped into the groove of the rest (Fig. 281), which is pressed close against the mucous membrane. This plan of "shouldering" is not necessary when the wire used is thin, only if it is stiff.

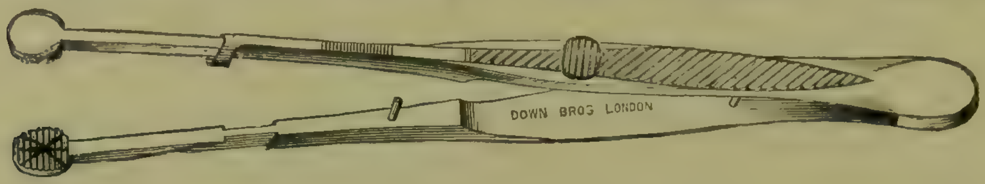

Fig. 280.—Suture-twisting Forceps.

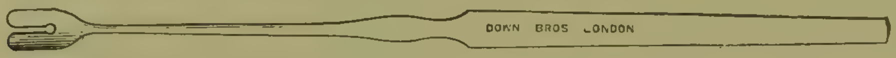

Fig. 281.—Suture-rest for Operation for Vesico-vaginal Fistula.

Another method of twisting the sutures is to use the S-headed suture-twister shown in Fig. 282. One end of the suture is slipped into one concavity of the S-head, the other into the other concavity (*see* Fig. 283). The ends of the sutures being held, the handle of the suture-twister is gently rotated until the pared edges are brought into sufficient apposition without tension.

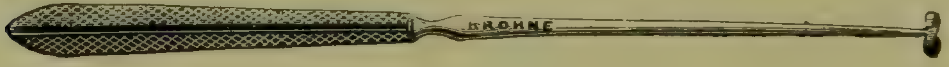

Fig. 282.—S-headed suture-twister.

When all the sutures are twisted, the ends are cut to the length of about an inch, the points bent over, and the ends then bent at right angles, close to the surface, alternately to one side and the other of the line of union. The ends thus lie flat against the mucous membrane, and the nozzle of an irrigator does not impinge against them.

If the edges of the fistula are thin, the plan of splitting the edges may be adopted. From each angle of the fistula an incision is made outwards for a quarter of an inch through the vaginal mucous membrane. The vaginal mucous membrane on the edge of the fistula is now raised with a sharp hook, and the margin split by sharp-pointed scissors bent on the flat, which separate the vaginal from the bladder mucous membrane from one angle to the opposite. The other lip of the fistula is treated in the same way.

There are several plans of placing sutures to unite the edges. One is to pass interrupted sutures of silver wire or fishing gut with a curved needle. The needle is inserted just within the vaginal mucous membrane, made to dip deeply into the cellular tissue round the angle of the split, and is brought out just beneath the mucous membrane of the bladder. The suture having been drawn through, the needle is inserted on the opposite side just beneath the bladder mucous membrane, made to pass round the angle of the split in a similar way, and brought out just beneath the vaginal mucous membrane. In this way the approximated surfaces are increased in area.

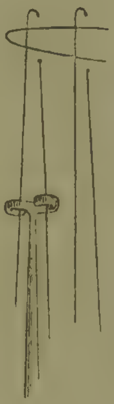
Fig. 283.—Mode of using S-headed suture-twister.

Another plan is to unite the bladder side of the split with a continuous suture of chromic catgut, the sutures passing just beneath the bladder mucous membrane. The vaginal side of the split may be united, either by interrupted sutures, as in the operation first described, or by another buried suture of chromic catgut, the sutures passing just beneath the vaginal mucous membrane.

In cases in which a large amount of bladder wall has been destroyed, it may be possible to fill the gap by transplanting a flap of tissue from the vagina or from the labium.* The necessity for this may sometimes be avoided, in cases in which the cervix uteri is firmly fixed by cicatricial tissue, and cannot be drawn down without great tension, by the plan of making a crescentic incision through the vaginal mucous membrane in front of the cervix and dissecting the bladder away from the cervix, as in the first stage of the operation of vaginal hysterectomy. The upper part of the anterior vaginal wall is thus rendered more movable, and it may become possible to unite the upper margin of the fistula to the lower without too great tension.

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* *See* Milton, "St. Thomas's Hospital Reports," vol. xvii., 1887.

At the end of the operation, sterilized milk and water should be injected into the bladder, to make sure that the union does not leak. If it does, the sutures may be twisted tighter or additional ones added. Most operators use a self-retaining catheter after the operation, until two or three days after the sutures have been removed. The best kind is a Skene's catheter, of a smaller size than that shown in Fig. 266, p. 603. A piece of rubber tubing, a few inches long, conducts the urine to a vessel placed between the thighs. Two catheters should be used, the catheter being changed and cleansed daily. A vaginal douche of perchloride of mercury, 1 in 3,000, may be used twice a day. It is useful to administer urotropin to keep the urine antiseptic. In the case of any cystitis arising, the bladder should be washed out with weak antiseptics, as described at p. 631. The sutures, unless buried, should be removed at from ten to fourteen days.

In the case of very large fistulæ, it may be necessary to repeat the operation once or twice before complete closure is obtained.

A URETHRO-VAGINAL FISTULA is generally brought easily into view by the aid of a bladder sound. The method of paring the edges and applying sutures is the same as for a vesico-vaginal fistula. The line of union should be transverse, that no constriction of the urethra may occur, and the sutures should be secured over a bladder sound in the urethra.

A fistula just at the origin of the urethra from the bladder, or at the neck of the bladder, may be very difficult to bring within reach if there are cicatricial bands fixing it up to the back of the pubes. In such a case it may be of advantage to dilate the urethra sufficiently to admit the index finger; and, if necessary, to divide cicatricial bands from the bladder side.

In the case of a VESICO-UTERINE FISTULA, the patient should be placed in the exaggerated lithotomy position, the uterus drawn down to the vulva by vulsella, and the bladder dissected away from the cervix uteri, as in the operation of vaginal hysterectomy, but without any opening of the peritoneal cavity. The vesical fistula should then be pared, and united by sutures of chromic catgut. If the aperture in the uterus is a narrow canal, it may be left to close of itself. If it is large, or a split of the anterior lip extends up to the fistula, the cervix should be pared in a V-shape down to the external os, and the edges united by sutures. Finally, the vaginal mucous membrane is united again to the cervix by sutures. These last may also be of chromic catgut, and then no sutures will require removal.

A URETERO-VAGINAL FISTULA is commonly the result of an operation such as vaginal hysterectomy, or abdominal panhysterectomy, or ovariotomy for a tumour extending deeply into the broad ligament. A piece of ureter may have been removed in the operation, or there may have been a lateral injury to its wall. Again, from interference with its vascular supply, the ureter may give way after an interval.

In the case of a uretero-vaginal fistula, it is not advisable to be in haste to interfere. A lateral opening in the ureter may spontaneously close, or possibly, if the fistula runs in dense contracting cicatricial tissue, the sinus may gradually contract, and the kidney become atrophied.

Diagnosis.—In the case of uretero-vaginal fistula, about half the urine will be passed naturally by the bladder, and half escape by the fistula. It will be possible, by injecting sterilized milk and water into the bladder, to make sure that the fistula is not vesico-vaginal. The history of the operation may determine which side is affected. If not, the bladder may be explored by Howard Kelly's speculum and the ureters catheterized.

Treatment.—It is possible to reach the ureter either by abdominal section or by a lumbar incision behind the peritoneum. But the simplest cure for a uretero-vaginal fistula is removal of the corresponding kidney. This may be carried out without great risk by a skilful operator, provided the other kidney is healthy and is secreting a proper amount of urea. It is, of course, necessary to be quite certain which ureter is affected. Eventually, the other kidney undergoes compensatory hypertrophy, the excretion of urea becomes normal, and the patient is none the worse.

It does not answer to implant the ureter into the rectum, for the urine irritates the rectum, and there is a risk of ascending sepsis affecting the kidney.

For incurable cases of vesico-vaginal fistula, Simon, of Heidelberg, introduced the operation of colpokleisis, or closing the vagina. The sequel, however, is that some of the urine stagnates in the vagina, and becomes septic; and the sepsis is apt to extend to the kidneys. The remedy is, therefore, worse than the disease.

All ordinary forms of female portable urinal are useless in the lying position, and not very satisfactory even when the patient is sitting or upright. I have had constructed the instrument shown in Fig. 284, which will keep a patient with an incurable vesico-vaginal or uretero-vaginal fistula quite dry, either in the lying position or any other.

The tube which conducts the urine to the reservoir is surmounted by an elastic globe, through which it passes. This globe can be distended with air to any desired degree by means of an air-pump adapted to a small side tube of rubber provided with a stop-cock. The main tube passes through a shield supported by straps, in which it fits tightly, and its position in which is adjustable. Thus the globe can be made to lie in the vagina below the level of the fistula, and be distended till it fits the vagina tightly, and prevents any leakage of urine. The urine does not stagnate in the vagina, but runs into the

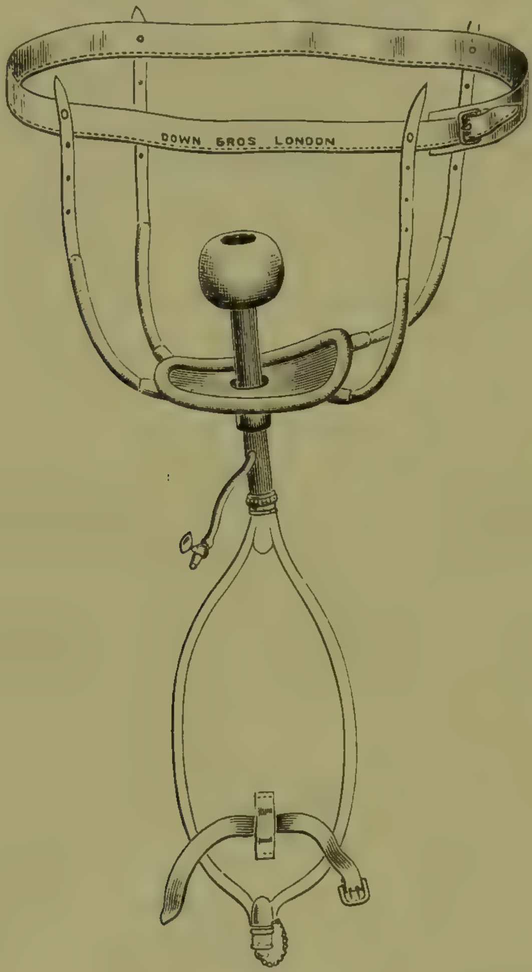

Fig. 284.—The Author's Portable Urinal for Vesico-vaginal Fistula.

reservoir strapped to the patient's thigh; and a douche can be used twice a day, when the instrument is removed.

This instrument may be used for an incurable fistula, or as a temporary measure before operation, for either vesico-vaginal or uretero-vaginal fistula, or when an artificial fistula has been made for the cure of cystitis.

CHAPTER XV.

FUNCTIONAL AND SYMPTOMATIC DISORDERS.

AMENORRHŒA.

Amenorrhœa, or the absence of the menstrual flow within the limits of age during which it should naturally continue, is to be distinguished from occlusion of the genital canal, and consequent retention of menstrual fluid, which gives rise to an apparent only, and not a real, amenorrhœa. Amenorrhœa, besides being a natural physiological condition in pregnancy and lactation, is a result common to a large number of constitutional and local pathological conditions. It has already been mentioned as a symptom of absence or imperfect development of uterus and ovaries, and of cystic or other form of degeneration affecting both ovaries; also as a sequel of severe inflammation of the pelvic organs, especially of acute ovaritis or pelvic peritonitis. The chief varieties are *primary amenorrhœa* (*emansio mensium*), in which menstruation has never appeared at all, and *secondary amenorrhœa* (*suppressio mensium*), or suppression of menstruation.

The age at which menstruation commences may vary in different persons by a considerable number of years without calling for any special medical interference; but the longer its onset is deferred beyond the normal age, the more likely is constitutional disturbance to attend the change. The difference depends partly on the general vigour and development of the whole body, partly on the relative development and activity of ovaries and uterus. Thus, in girls of deficient intellect, puberty is commonly much retarded. The occurrence of any serious illness within a few years before the natural date for the commencement of menstruation often has the effect of considerably deferring its appearance. Primary amenorrhœa may be due to absence or imperfect development of uterus and ovaries, and imperfect development of either or both organs strongly predisposes to the production of secondary amenorrhœa, or a premature menopause, by comparatively slight causes.

Sudden suppression of menstruation during the period of flow may be produced by cold or by mental emotions, even when the suppression is not a symptom of actual inflammation; and this may be the starting-point of secondary amenorrhœa of considerable duration. Long-protracted and even permanent amenorrhœa may be the sequel of acute diseases or strong depressing emotions, or the menopause may come on prematurely without obvious cause. Sometimes superinvolution of the uterus after labour is a starting-point. Towards the natural period of cessation it is common for considerable periods of amenorrhœa to alternate with an occasional and sometimes excessive flow.

Any chronic and wasting disease, and more especially phthisis, or any cause of chronic pyrexia, may induce primary or secondary amenorrhœa, according to the age at which it makes its appearance. Other general diseases leading to anæmia, and consequent amenorrhœa, are splenic leukæmia, splenic enlargement without leukæmia, Hodgkin's disease, myxœdema, and Graves' disease. Again, amenorrhœa may be produced by repeated loss of blood, as from hæmorrhoidal tumours. The same effect may result from a simple anæmia and failure of nutrition, due to insufficient diet, indigestion, to a too sedentary life, or to the absence of appetite and semi-starvation of nervous origin, which is sometimes found in neurotic women. A sudden change in the mode of life, such as often occurs in the case of girls on going to school, is especially likely to interrupt menstruation, when combined with any other of the above-mentioned causes. Amenorrhœa also sometimes comes on shortly after marriage, even without any pregnancy; and is still more likely to occur after illicit intercourse, when there is a strong reason to dread the possibility of pregnancy.

Among all the causes of amenorrhœa there is none more frequent or more important than *chlorosis*, the relation of which to menstruation is a somewhat complex one. The important significance of this relation is shown by the fact that the disease is almost limited to the female sex, and to an age not far removed from that of puberty. Chlorosis is a disease largely dependent upon congenital predisposition, and frequently associated with imperfect development of the heart and narrowness of large arteries. It has also a close relation to the nervous system, for it is often characterized by the symptoms of nervous depression or irritability, and frequently owes its origin to a powerful depressing emotion, such as disappointment in love, or bereavement. As regards the condition of the blood, chlorosis differs from other forms of anæmia chiefly in the fact that the deficiency in hæmoglobin is far more than proportionate to the deficiency in number of the red corpuscles. This circumstance accounts for the extreme degree of the pallor of the skin, and its greenish tint.

Chlorosis may come on before the age of puberty, and give rise to primary amenorrhœa. In other cases, the commencement of menstruation is the starting-point of chlorosis, the extra demand which thus arises having proved too much for the feeble powers of the system. In more rare instances, the same effect is produced by a menstruation which, in the first instance, was excessive, although it becomes scanty, or is entirely interrupted, after the chlorosis is established. In general, therefore, the amenorrhœa of chlorosis is secondary to the condition of the system generally, and that of the blood. It is probable, however, that in many, if not in most, cases the deficiency of the stimulus to nutrition furnished by ovarian development and activity contributes to the disease. Thus, the tendency to the production of fat at the expense of muscular tissue, so often characteristic of ovarian torpidity, is frequently observed in chlorosis. Again, cases are not very unfrequent in which the amenorrhœa appears to be primary, and to be associated at first with plethora, while anæmia and the signs of chlorosis only come on after an interval. The same inference may be drawn from the cases of chlorosis in which benefit is derived from marriage, or from direct emmenagogue treatment.

Contrasted with cases of chlorosis are those in which primary or secondary amenorrhœa is associated with an appearance of plethora and symptoms of general disturbance, similar to those which frequently attend the menopause, such as headache, flushing of the face, constipation, hepatic derangement, and a tendency to morbid nervous and mental conditions. Ovarian inactivity may then generally be inferred, and this may be due either to a congenital condition, or to a sedentary life, with too good living. To these symptoms may be added hæmorrhages from various parts, as the lungs, stomach, nose, or rectum, or even from a wound or ulcer. These are sometimes spoken of as ectopic or vicarious menstruation. It is very rarely, if ever, that the vicarious hæmorrhages have any monthly periodicity, but they indicate an excess of vascular pressure which does not find its natural relief. Almost, if not quite, invariably there is some local cause for the bleeding, such as a small ulcer or abrasion.

Diagnosis.—In primary amenorrhœa it is desirable to make a local examination, if periodical pain or any other symptom suggests the suspicion that atresia may exist; if the appearance of menstruation is delayed many years beyond the normal time; if signs of general or local plethora coexist with amenorrhœa; or if marriage is projected. If a girl is subject to leucorrhœa, it may safely be assumed, without examination, that there is no absence of uterus and vagina, although the discharge may come from the vagina only. In secondary amenorrhœa, special care must be taken to decide the question as to the possibility of pregnancy. If, in a healthy-looking young woman, menstruation, having been previously normal, has ceased suddenly without the occurrence of any illness, pregnancy is naturally the first cause which suggests itself. In a suspicious case, an inspection of the breasts will often indicate the necessity for a more complete examination. Special care should also be taken to seek for signs of any bygone inflammation of the uterus or surrounding parts, especially in the form of pelvic peritonitis. Chlorosis is generally manifest in a patient's face. Even in the slighter degrees of anæmia there are usually characteristic symptoms in the shortness of breath, debility, neuralgic pains, or indigestion, while anæmic murmurs are often to be heard over the heart and large arteries. If there is no manifest chlorosis, or other sufficient cause, signs of phthisis or other constitutional disease should be carefully searched for. The diagnosis of the conditions of uterus and ovaries associated with amenorrhœa has already been considered (*see* pp. 117, 467).

Treatment.—If amenorrhœa is a symptom of any constitutional disease, such as phthisis, the treatment should be directed solely to the primary disease; and if it is the sequel of pelvic inflammation, the inflammation must be treated in the first place. In all forms of anæmia, but especially in chlorosis, iron is the great remedy, and in chlorosis it should be given in large doses. It is necessary, however, in the first place, to see that the digestive organs are in a condition to bear and to assimilate the iron, and it is often desirable to give, first, vegetable bitters with salines, or combined with acids or alkalies, according to circumstances.

It is believed that a large element in the causation of chlorosis and other forms of anæmia associated with digestive disturbance is the absorption of fæcal toxins consequent upon chronic constipation. Idiopathic or pernicious anæmia has been attributed to a septic infection of the alimentary tract originating in the mouth. Hence, it is of the first importance to pay attention to the teeth, and to secure a daily evacuation of the bowels, the want of which is often due to carelessness or neglect. Aperients, especially salines, should be given in the first instance. For a permanent effect, reliance should be placed rather upon regular exercise, with a suitable diet, and, if necessary, abdominal and general massage.

Dr. Barnes recommends iodide of potassium as preparatory to, or in combination with, the iron. The syrup of the iodide of iron may often be used with advantage. If digestion is weak the iron should be given in the most easily assimilable form, as the ferrum redactum, or one of the vegetable salts. It is often of use to combine it with aloes, especially if any tendency to constipation exists. The aloes and iron may be given in pill, or the decoctum aloes co. may be combined in a mixture with the ferri et ammoniæ citras. Permanganate of potash, given in pill with unguentum kaolin, or in solution, in doses of two or three grains, or in the form of Liq. Mangan. Ferri Peptonat (Gude), is sometimes effectual as a remedy for functional amenorrhœa when iron has failed. Other tonic medicines, as quinine, strychnia, and especially arsenic, also sometimes prove useful. Cod-liver oil is beneficial, except in cases where there is a tendency to corpulence.

Hygienic treatment is still more important than medicinal. It should comprise nourishing diet, especially an ample allowance of fresh meat, abundance of fresh air, judiciously regulated exercise (the most effectual form of which is riding on horseback), cold fresh, or still better, salt water baths, and change of air and scene. A stay at the seaside or watering-place with chalybeate springs is especially useful. When anæmia is marked, especially if the patient is breathless, exercise should not be sufficient to cause fatigue. But, when anæmia is slight, or when amenorrhœa persists after the apparent cure of anæmia, a carefully regulated gymnastic course, such as the Swedish exercises, often succeeds when other means fail. If the appearance of menstruation be deferred several years beyond the usual time, it is of special importance to guard against a too sedentary mode of life, overmuch study, or unsuitable diet; for if the commencement of ovarian activity be too long deferred, the natural development of the pelvis at puberty may fail, and menstruation itself is more subject to disturbance when it commences much too late. In all cases of amenorrhœa associated with anæmia, especially in the young, careful watch should be kept for the appearance of any sign indicating the onset of phthisis. A warm seaside residence in winter, when circumstances allow it, has often a beneficial effect on the menstrual functions, even apart from any question of delicacy of chest.

In amenorrhœa or scanty menstruation associated with apparent plethora rather than anæmia, the diet, while nourishing, should be rather sparing, and should consist more of the nitrogenous than of the fat-forming elements of food. A greater amount of exercise is desirable than in anæmic cases, and occasional purgatives are often called for. In all cases in which the development of uterus or ovaries, and not the general health, is at fault, marriage generally has a beneficial effect, especially when it is ovarian activity which is defective; and, if pregnancy occurs, menstruation is usually afterwards more natural.

If menstruation is arrested by cold or any other cause in the midst of a period, without the occurrence of actual inflammation, and the arrest is followed by headache or other symptoms of general congestion, an attempt should be made to restore it by the use of hot hip-baths or foot-baths with the addition of mustard, by hot applications to the hypogastrium, and the administration of acetate of ammonia with ether, or (with caution and moderation) of the domestic remedy of gin in hot water. Similar treatment should be repeated at ensuing periods, if menstruation does not come on normally.

In all cases of amenorrhœa not dependent upon anæmia, but associated with general or local congestive symptoms, a similar mode of stimulation may be employed for three or four consecutive days in several succeeding months, either at the period of menstrual nisus, if that is revealed by any sign, or at intervals of about four weeks. The hip-bath may be taken at night, followed by a hot linseed or bran poultice to the hypogastrium, and the hot foot-bath with mustard may be used in the morning, while a pill of aloes and myrrh is taken every night. Stimulating liniments may be employed to the inner surfaces of the thighs; and hot vaginal injections or enemata may also be tried. If there are symptoms of plethora, such as headache, with flushing of the face, it is sometimes of use also to apply about the same time three or four leeches to the inner surfaces of the knees or thighs, or, when there is pain indicating local congestion, to the labia, or, in married women, to the cervix uteri. This measure tends to induce a periodical fluxion towards the pelvic region, and is especially indicated in primary amenorrhœa of long standing, associated with signs of plethora, or when vicarious hæmorrhage has occurred.

There are some cases in which, after full trial of measures of this kind, it may be desirable, but generally only in married women, to use direct means of stimulus to the uterus or ovaries. Such treatment should be limited to cases in which there is no constitutional condition to account for the amenorrhœa, but an imperfect development of the uterus, not too extreme in degree, is discovered, or deficient development of the ovaries is inferred, and in which, also, either there is reason to believe that the absence of menstruation is affecting the health injuriously, or vicarious hæmorrhages occur. It is to be remembered that women themselves are very apt to attach an exaggerated importance to amenorrhœa, and that, in the absence of any evidence of injurious effect from plethora, they may be advised not to concern themselves too much about this condition.

Supposing that a sufficiently urgent reason exists for adopting local treatment, a Faradic current may be passed through the uterine and ovarian regions every day or every other day. The electrodes may be placed, one over the sacrum, the other over the ovarian regions, alternately, or one rheophore may even be introduced into the uterus. Of forms of stimulus applied directly to the uterus, the least hazardous is to pass occasionally a metallic bougie, so as slightly to dilate the cervix. The most powerful means of all is the introduction of an intra-uterine stem, and especially of the galvanic stem of Simpson, the upper half of which is made of zinc, the lower of copper. The effect of this is rather that of a chemical than an electrical stimulus, owing to the constant slow production of chloride of zinc, although doubtless a weak galvanic current over the surface of the uterine mucous membrane is produced. A modified kind of galvanic pessary, in which the zinc and copper are arranged side by side, in the form of a spiral coil of wire, is more readily tolerated, since it allows the uterus more mobility. I have never met with a case in which I considered the disadvantages of amenorrhœa to be so great as to warrant the risk which is incurred by the use of intra-uterine stems.

If a stem is used at all, a simple stem of glass or vulcanite is probably safer than the galvanic stem, and should be tried first. If a galvanic stem is used, it should not be left more than about three weeks at a time, on account of the corrosion and consequent roughening of the zinc. It should be an indispensable condition that the general health be such as to make it quite certain that the cause of amenorrhœa is solely local, that there has been no previous inflammation, and that the patient can be kept completely under control. When amenorrhœa or scanty menstruation is the result of pelvic peritonitis, cellulitis, or acute ovaritis, the use of the sound or any other local treatment to the uterus must be avoided. When atrophy of the ovaries is inferred to have taken place, a cautious trial of the milder kind of local treatment may sometimes be desirable, if the condition is recent, but should not be prolonged if not soon successful.

Besides aloes, which influences the uterus from the sympathy of that organ with the rectum, some other drugs have the repute of being direct emmenagogues. Of these the most effective appear to be oil of savine, in doses of from five to ten minims, and the tinctura hellebori, in doses of twenty or thirty minims. Ergot is also reputed to act as an emmenagogue in certain cases, as well as a hæmostatic in excessive menstruation. All these drugs, however, are apt to prove disappointing, and can hardly be expected to produce any effect when the development of Graafian follicles is altogether wanting. In amenorrhœa or scanty menstruation resulting from chronic metritis, or from peri-uterine inflammation, tincture of iodine, in doses of from five to ten minims, sometimes acts as an emmenagogue.

In chlorosis and other forms of anæmia, direct emmenagogues should not be used until full trial has been given to treatment by iron, with other tonics, and hygienic measures. In obstinate cases, stimulation by heat and external applications every four weeks may be tried, or the Faradic current may be passed through the ovarian regions.

SCANTY MENSTRUATION generally depends upon causes similar to those which produce amenorrhœa, but acting in lesser degree. It is to be treated in a similar manner.

MENORRHAGIA AND METRORRHAGIA.—By the term menorrhagia is meant an excessive loss of blood from the uterus at menstrual periods; by the term metrorrhagia, a loss during the intervals, or of such an irregular kind that no monthly periodicity can be detected. The following are the main causes of menorrhagia and metrorrhagia:—(1) A morbid condition of blood, such as is found in Bright's disease, in some forms of simple malnutrition, and in febrile affections, especially those of a zymotic kind. (2) A general undue relaxation of the vessels or diseased condition of their walls, the result either of hæmophilia, of general debility, of the effects of a hot climate, or any other cause. (3) General active hyperæmia, the result of constitutional plethora or excessive arterial pressure. (4) Passive hyperæmia, whether general, as from obstructive heart, lung, or liver disease, or local, as from the pressure of a tumour, or from displacement of the uterus. (5) Want of tone in the muscular walls of the uterus, by the contraction of which the circulation through the organ is normally regulated and controlled. This may result from defective general nutrition, or from a morbid local condition. (6) Local active hyperæmia. This may depend upon the retention of a portion of placenta or membranes within the uterus; upon inflammation of, or the presence of new growths in, the uterus itself, whether body or cervix, the ovaries, or adjoining parts; upon ovarian irritability or congestion; or upon mental or mechanical causes, such as sexual excitement or sexual excess. (7) Increased surface of the mucous membrane, resulting from enlargement of the body of the uterus. (8) A diseased condition of the uterine mucous membrane, whether due to inflammation, villous or glandular degeneration, or to new growths, especially to those in a state of ulceration.

Among the organic causes included in the above list, especially after the age of thirty, fibroid tumours of the uterus must be specially looked out for as a cause of menorrhagia, and cancer as a cause of metrorrhagia.

Another practically useful classification of menorrhagia and metrorrhagia is to divide them into those forms due to a general systemic cause, and those depending upon some morbid condition of the sexual organs. The first of these classes comprises the first, second, third, and a great part of the fourth and fifth of the above-mentioned divisions, while the second includes the remainder.

The amount of blood lost in menstruation varies considerably in different individuals, the difference depending in great measure upon the development and activity of the ovaries. When the ovaries are more active than usual, menstruation commences early in life and continues late, while the flow is considerable in amount.

sexual feelings are strong, and there is a liability to menorrhagia or metrorrhagia, especially soon after the first establishment of the menstrual function, as well as to active hyperæmia of the sexual organs.

Diagnosis.—In menorrhagia, some estimate of the degree of the affection may be obtained from the number of diapers used. If more than a dozen are required throughout the period, the flow may generally be regarded as above normal. When excess is great, women may find it necessary to wear several diapers at a time. Passage of large clots also indicates excess. As a general rule, the symptom of menorrhagia or metrorrhagia is one which calls for local examination. In the case, however, of menorrhagia of only moderate degree in an unmarried girl soon after the age of puberty, such as is a common result of a somewhat excessive ovarian activity, it may be desirable in the first place to try the effect of general treatment. In investigating the cause of the disorder all available means of examination should be used, not only vaginal touch, but bimanual examination, the sound, and, except in the case of virgins, the speculum. If the source of the affection is not otherwise discoverable, and if it does not yield readily to treatment, the cervix should be dilated, to allow exploration of the cavity of the uterus.

Treatment.—The curative treatment of the various disorders of the sexual organs, of which menorrhagia and metrorrhagia are symptoms, has already been considered. It remains only to speak of the immediate and palliative treatment, and of the management of those cases in which no local cause is discoverable. Menorrhagia has occasionally actually produced a fatal result in cases in which no morbid condition could be detected even at an autopsy, and hence the primary indication is often simply to arrest the hæmorrhage.

In the first place, all systemic causes should be treated, as far as possible, and any general passive hyperæmia relieved, especially by saline purgatives if any constipation is present (*see* p. 168). If hæmorrhage is at all severe, perfect rest in the horizontal position, or with the pelvis raised, should be secured, and all hot drinks or alcohol must be avoided. The most efficient hæmostatic is ergot. Half-drachm or drachm doses of the liquid extract, or of the liquor secalis ammoniatus, may be given in cases of moderate severity. In more serious ones, drachm doses of the powdered ergot, in the form of fresh infusion, are to be preferred, or subcutaneous injections may be given, either of gelatine discs, or of some other preparation of ergotin (*see* p. 381), especially if a rapid effect is required. Next to ergot in value comes digitalis, given in rather full doses (such as half a drachm of the tincture), and strychnia, either of which may be combined with the ergot. Quinine acts as a hæmostatic if given in very large doses. Cannabis indica, in doses of fifteen or twenty minims of the tincture, is also useful, especially when the hæmorrhage is associated with pain. Full doses of bromide of potassium are of value, particularly when there is excessive ovarian activity. This drug may often be usefully combined with cannabis indica. Other reputed astringents may be combined with ergot, such as tincture of hydrastis in doses of forty to sixty minims, and hamamelis, in the form of hazeline, thirty or sixty minim doses. Adrenalin chloride, or Oppenheimer's Renaglandin, in doses of one drachm, is sometimes efficacious, especially if the bleeding depends upon a general vascular condition. In very severe hæmorrhage, full doses of opium should be given.

Cold has been employed to check menorrhagia, but it is now considered that the application of heat, by means of hot water, is equally or still more efficacious for this purpose, and more free from risk. Injections of hot water at a temperature of 110° or 115° Fahr. into the vagina, or, by means of an irrigator, into the uterus after dilatation of the cervix, may be employed. If the loss is alarming, the vagina should be plugged. In plugging the vagina, it is best to use long strips of iodoform gauze, a piece of tape being attached to those first introduced, to facilitate their removal. The strips are to be introduced, one by one, through a Sims' or cylindrical speculum, the speculum being gradually withdrawn meanwhile, until the vagina is fully distended. The plug should not be left more than twenty-four hours, but may be renewed if necessary. If bleeding still recurs after dilatation of the cervix, the cavity of the uterus should be swabbed with a styptic fluid, such as the tincture of iodine, the liquor ferri perchloridi, or liquor ferri subsulphatis.* If even this fails, styptic intra-uterine injections may be used as a last resort, and with due precautions (*see* p. 250).

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* The liquor ferri subsulphatis of the United States Pharmacopœia, or Monsell's solution, is prepared in a similar way to the liquor ferri perchloridi of the British Pharmacopœia, but the ingredients are so proportioned that the result is a basic ferric oxysulphate. The proportions are (by weight)—sulphate of iron, 5,760 grains; sulphuric acid, 510 grains; nitric acid, 780 grains. Water is added to make up 12 fluid ounces. A less irritating fluid than the liquor ferri perchloridi may also be made by dissolving the solid perchloride in water.

After relief of the hæmorrhage, special precautions, particularly with regard to rest, are to be used for several ensuing periods, while any local cause of hæmorrhage should receive suitable treatment. Cold bathing during the inter-menstrual intervals is generally beneficial. In menorrhagia dependent on debility or an impaired quality of blood, or that associated with anæmia, provided that there is no active pelvic engorgement or tenderness, prolonged administration of iron in an astringent form, such as the liquor* or tincture of the perchloride of iron, in combination with ergot, is often of value. In mild cases, when no organic lesion is discoverable, the administration of mineral acids, with cinchona or quinine, may complete the cure.

DYSMENORRHŒA.—Dysmenorrhœa is in many cases a symptom of some definite morbid condition. But in some instances it forms the substantive complaint. The subject of it is free from discomfort at other times, and there is no very manifest lesion of the uterus or other pelvic organs to be discovered.

The following is the most complete classification of dysmenorrhœa:—

1. Dysmenorrhœa due to painful uterine contractions.
    - (*a*) Obstructive.
    - (*b*) Spasmodic.
2. Congestive Dysmenorrhœa.
    - (*a*) Uterine.
    - (*b*) Ovarian.
    - (*c*) Due to congestion of Fallopian tubes or other adjacent parts.
3. Neuralgic or neurotic dysmenorrhœa.

Dysmenorrhœa may also be due to painful contraction of the Fallopian tubes; but this is rarely identified as a separate cause.

The separate varieties are by no means distinct; but often two or more of them are combined in the same case.

Dysmenorrhœa due to painful uterine contraction is characterized by the pain being intermittent, the paroxysms not lasting for more than five minutes or so at a time. It is central and generally felt in the front rather than the back.

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* Liquor ferri perchlor. ♏x.; ext. ergot liq. ♏xxx.; acid. citrici, gr. v.; liq. chlorof. ad ℥j.—ter quotidie.

The intervals may be free, or there may be a continuous dull pain in addition, if the congestive element is combined. The pain of contraction is not relieved by rest or lying down, and the patient is often unable to remain still. The paroxysms often produce nausea or vomiting.

The dysmenorrhœa is frequently primary, beginning with the first menstruation, though often it becomes more severe as time goes on; and sometimes, especially in the case of membranous dysmenorrhœa, it may be acquired.

It is not always easy to make sure that the pain is really due to contraction. Thus I have known a patient who had apparently a typical spasmodic dysmenorrhœa, with paroxysms lasting only a few minutes, in which she writhed in agonies and could not lie still, and which often produced vomiting. But she had no menstruation, and no discoverable uterus, but only a menstrual molimen from the ovaries.

In my experience, dysmenorrhœa due to painful uterine contractions is a comparatively rare form. Patients will often say that the pain is intermittent and spasmodic; but, when they are cross-examined, it is found that the paroxysms last for half an hour up to several hours. The pain is, therefore, only spasmodic in the sense that toothache may be spasmodic.

Obstructive Dysmenorrhœa.—The most typical form of obstructive dysmenorrhœa is membranous dysmenorrhœa, already described (*see* pp. 257–261), in which the pain is due to uterine contractions, by which the membranes are expelled. This is the only variety which has a definite pathology. I believe that slight degrees of membranous dysmenorrhœa are commoner than is generally supposed; and that, in cases presenting the aspect of spasmodic dysmenorrhœa, small shreds of mucous membrane may often be found by careful examination of the secretion.

Another undoubted variety of obstructive dysmenorrhœa is that in which the dysmenorrhœa is acquired after some operation leading to contraction of the canal from the uterus, such as supra-vaginal amputation of the cervix for cancer, or a plastic operation on the cervix in which too much tissue has been removed. It may also be due to fibroid tumours or cancer of the cervix obstructing the cervical canal, especially if clots are formed within the uterus.

There are many other cases in which the existence of the obstructive element is a matter of dispute. Some would consider that there is an obstruction due to flexion, stenosis of the external os or canal, or the existence of a tenacious plug of mucus in the cervix, not forming a serious obstacle, but sufficient to set up painful contractions in a neurotic subject, when the menstrual discharge is not absolutely fluid, or clots are formed within the uterus. Others would interpret the same case as a pure neurosis, and the painful contractions as purely spasmodic without any physical basis.

It is generally agreed that dysmenorrhœa due to painful uterine contraction is more curable than any other form; and that dilatation of the canal, without any other treatment, will often cure it. This appears to be a strong argument in favour of obstruction to the canal having some influence in the case, since the mere stretching of a muscle does not seem likely to subdue its tendency to spasm for more than a very short period.

There are many cases, however, of very narrow uterine canal without any dysmenorrhœa. It appears clear, therefore, that pain is only produced if the menstrual flow is not perfectly fluid, and if either the canal is impeded by tenacious mucus, or shreds of membrane or clots, small or large, are discharged with the flow.

In obstructive dysmenorrhœa the pain is limited to the flow, and the patient is well in the intervals, unless some congestive or inflammatory element is added. It is more or less spasmodic, but some continuous discomfort may be produced in addition through irritation of the tender mucous membrane by shreds of membrane or clots while retained *in utero*. There is no premonitory pain, but the pain generally commences with the flow. It may be of very short duration, or it may last for a few hours, or for the first day or two of the period, but rarely continues throughout the whole of it. The dysmenorrhœa often begins from puberty, but becomes aggravated as years go on. Often it has at first the character of purely obstructive dysmenorrhœa, but after a course of years symptoms of congestion or inflammation are added.

Obstructive dysmenorrhœa is not to be separated altogether from spasmodic or neuralgic dysmenorrhœa; but often it is a question of interpretation which is the preponderating element in any given case. Sometimes this can only be decided by the therapeutic test. The best clinical evidence of obstructive dysmenorrhœa is the expulsion of clots, combined with a flow which is scanty, or never at any time exceeds the normal. This shows that the blood is retained long enough in the uterus to allow clots to be formed, before it becomes mixed with the vaginal secretion. The evidence is still stronger, if the patient observes that a paroxysm of pain precedes the passage of clots. Some authorities deny the existence of obstructive dysmenorrhœa, although they recommend dilatation of the uterus for the relief of the pain. I have on several occasions produced dysmenorrhœa by removing rather too much tissue in the operation of trachelorrhaphy, and so narrowing the cervix, and afterwards cured it again by the use of dilating bougies. This appears to be as positive evidence of obstructive dysmenorrhœa as can be expected.

Spasmodic Dysmenorrhœa.—By some authorities this is considered to be the most typical form of dysmenorrhœa, and is regarded as a neurosis consisting of painful contractions of the uterus, analogous to the painful intestinal contractions in colic, and not the result of an obstacle to the menstrual flow. There is, at any rate, a very large neurotic element, whether or not there is any physical exciting cause for the contractions. The pain commences with or soon after the flow, coming in paroxysms of only a few minutes' duration, and is often characterized by its extreme intensity, much greater than that usually produced by a definite cause of obstructive dysmenorrhœa, such as a dysmenorrhœal membrane. Frequently it completely disables a patient while it lasts, and it often produces nausea or vomiting. The dysmenorrhœa is generally primary, beginning from the age of puberty. The patients are usually of the hysterical temperament, sexually excitable, and over-sensitive to pain of all kinds.

Congestive dysmenorrhœa includes inflammatory dysmenorrhœa, since, in the case of the latter, the periodical pain is caused by the flux of physiological congestion coming upon an inflamed or damaged organ.

Congestive dysmenorrhœa of uterine origin may be primary, if there is a cause of congestion before puberty, such as abnormal sexual conditions. More frequently it is acquired, coming on at a later period. In many cases it appears to be a sequel of spasmodic or obstructive dysmenorrhœa, and the symptoms of it are added to the former. Otherwise, as it occurs in single women, it most frequently originates either within a few years of puberty, about the time when a girl takes to long dresses and tighter corsets; or between the ages of twenty-five and thirty, when the continuance of celibacy may be becoming a disappointment. Uterine leucorrhœa in the intervals of menses frequently coexists; and the most common cause of the dysmenorrhœa appears to be a chronic endometritis, or, at any rate, a morbid condition of the endometrium, which some might regard as inflammatory and some as only a congestive hypertrophy. Not unfrequently there is visible evidence of this in the shape of a granular "catarrhal patch" on the cervix around the external os.

Acquired congestive dysmenorrhœa may also be secondary to definite anatomical lesions. Thus it may arise from fibroid tumours or displacements of the uterus in the married or single; and in the married from infective endometritis, subinvolution of the uterus, lesions of the cervix due to parturition, or uterine congestion secondary to parametritis or perimetritis.

In the most typical form of congestive uterine dysmenorrhœa the pain commences some time, from one or two up to six or seven days, before the flow. It is increased by the flow, but gradually subsides towards the end of the period. It is more or less continuous; or, if there are paroxysms, they are longer than can be accounted for by a uterine contraction. It is central, felt most in front, but generally also in the back, and may extend to the sides and down the thighs. In some cases the pain is most acute before the flow, is relieved by the flow, but may be increased again for two or three days after the flow has ceased.

The pain is relieved by rest, and is increased by constipation. If the menstrual flow varies in quantity, the pain is greatest when the flow is least.

Ovarian Dysmenorrhœa is a special variety of congestive dysmenorrhœa. The pain has the usual locality of ovarian pain, in one or both groins, radiating down the thighs and upwards towards the mammæ. The pain begins some days before the flow, is not specially increased by the flow, sometimes is even relieved by it. The pain is generally most on the left side. Frequently the pain continues in less degree through the intervals of menstruation. In other cases, after being at first limited to menstruation, it afterwards becomes extended through the intervals.

In some cases there appears to be an actual lesion of the ovary, and the ovary may be felt as tender, or enlarged and tender. When the ovary is bound down by adhesions, or its surface indurated by fibrous or chronic inflammation, pain may be due to the hindrance to the rupture of the Graafian follicle. In other cases, although the pain is located in the ovary, it appears to be rather sympathetic with the uterus. The uterus is more tender than the ovary, and alone shows any morbid sign.

Of *dysmenorrhœa due to congestion of the Fallopian tubes or other adjacent parts*, the most important variety is that resulting from the chronic effects of perimetritis, especially when there is a pyosalpinx or other form of tubal distension. The menstrual flux increases the pain due to the local inflammation. In this case the pain is most at one or both sides of the uterus, and is generally only an exaggeration of pain existing in the intervals. The dysmenorrhœa is generally subordinate to the general effects of the tubal disease.

Neuralgic dysmenorrhœa hardly exists as an entirely separate variety; but the neuralgic or neurotic element is a very large one in many forms of dysmenorrhœa; and often a hypersensitiveness of nerves is the main element in the case. The term neuralgic dysmenorrhœa may be applied to cases in which there is little or nothing abnormal discoverable in the uterus; and in which the chief complaint is of reflex pains felt in various localities, such as the back, thighs, and head.

Periodic Intermenstrual Pain. — This condition has no recognized title in English, but in German is called Mittelschmerz. Some patients suffer from it continuously or at intervals for years; and it is difficult to cure. At an interval, generally constant for the same patient, and usually from seven to ten days after the end of the period, pain comes on, more severe than that of the period. It lasts for two or three days, and subsides before the next period. The pain is usually in one or both ovarian regions, but it may be central, and sometimes it is accompanied by uterine leucorrhœa.

The most probable explanation is that either the pain is due to tension caused by the commencing development of the Graafian follicle, before it reaches the surface of the ovary and is free to expand; or else that in these patients ovulation habitually takes place, not in connection with the period, but at a regular interval before it. Mittelschmerz has been ascribed to chronic salpingitis, such a condition having been found on abdominal section in a patient who suffered from it; but salpingitis often exists without any Mittelschmerz. Mittelschmerz is naturally curable by removal of the uterine appendages; but I have not yet met with a patient whom I considered to suffer enough from it to justify that operation.

Treatment.—The treatment of the various morbid conditions, inflammation, fibroid tumours, and the like, which may cause dysmenorrhœa, has already been described. It only remains here to discuss the palliative treatment during the attack of pain, and the treatment of those cases in which no very definite lesion, except perhaps a slight leucorrhœa, can be discovered. The former will first be considered.

An essential point is to enjoin the avoidance of all exertion; and, if pain is severe, the horizontal position should be maintained during the period. In congestive dysmenorrhœa, saline purgatives should be given just before the period, at which time there is often a tendency to constipation, and full doses of bromide of potassium are useful. In all cases the hot hip-bath, or the whole bath, in which the patient should remain for as much as half an hour, affords much relief. Hot applications to the hypogastrium have a similar effect, and hot water with mustard to the feet, followed by rest and warmth in bed, is also useful. Cold should always be avoided, and the wearing of woollen drawers is generally desirable, if the patient is not kept to her bed. Considerable alleviation may also be procured by diffusible stimulants and the milder sedatives. Among the former may be mentioned ether and ammonia, one or both of which may be given with the liquor ammoniæ acetatis.* One of the most efficacious is the favourite domestic remedy of gin in hot water, which tends to increase the flow, as well as to diminish pain, but, for obvious reasons, much caution is necessary in recommending it. Essence of ginger in hot water may be used as a substitute. Among the most useful sedatives are antipyrin, phenacetin, hyoscyamus or belladonna, hydrocyanic acid, chloral, camphor, or bromide of camphor in capsules.

Antipyrin and phenacetin are the most generally useful. At the onset of the pain, antipyrin may be given in doses of 15 grains at intervals of two hours, up to three or four doses, unless the patient has a special susceptibility to the drug. Afterwards it may be continued at longer intervals. If this fails, phenacetin may be given in a similar way. The addition of caffeine to either tends to counteract any depressing influence on the heart.

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* ℞ Sp. ætheris sulphurici, ♏xxx.; sp. chloroformi, ♏xv.; liq. ammoniæ acetatis, ℥ss.; aq. ad ℥j.

Cannabis indica is very useful, especially when the flow is profuse, but it has the disadvantage of being uncertain in its quality and effects. Small doses should, therefore, be given at first, and increased up to about twenty or more minims of the tincture, or two grains of the extract.[*] Asafœtida may be given by enema, if there is much hysteria. Opium and its alkaloids are, of course, the most effectual remedies for the pain, but they should be avoided, as far as possible, in all chronic conditions, because they are apt to set up the morphia habit in neurotic patients; and because, by damaging the nervous system, they render the nerves more over-sensitive to pain. They may be required, however, in severe cases, especially when some inflammatory condition is present, as when dysmenorrhœa is the sequel of peritonitis. They may often conveniently be given in the form of suppository or enema.

The tendency to neuralgia and nervous hyperæsthesia should be treated in the intervals of menstruation by tonic and hygienic remedies, with cold bathing, air and exercise, and sufficient occupation. The same treatment tends to promote the formation of a more healthy menstrual decidua if menstruation is scanty as well as painful. Marriage is generally beneficial in primary congestive dysmenorrhœa, the result of ovarian irritation without any serious organic lesion. Mild forms of obstructive dysmenorrhœa are also often cured by marriage, followed by parturition. If, however, the marriage prove sterile, as is likely to be the case when the obstruction is considerable, the condition is frequently rendered worse. As far as regards curative treatment, in cases in which no definite organic lesion is discoverable, dilatation alone may effect a cure, if the pain is due to uterine contractions. It is not so likely to do so if the dysmenorrhœa is congestive. In such a case, if any operation is performed, curetting or other treatment to the endometrium should be performed in addition.

In some very severe and prolonged cases, especially if a patient has to earn her living, and is prevented from doing so by the monthly disablement, mutilating operations have to be considered. They should be avoided, however, in young women, unless the probability of marriage is remote.

The ovaries may be removed and an artificial menopause thus established, or the uterus may be removed by vaginal hysterectomy. The latter operation has less influence on sexual power, and is thus less mutilating. Moreover, the nervous symptoms of the menopause, which are apt to be severe and prolonged if the ovaries are removed in young women, are less marked.

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[*] The following is an average dose:—Potass. bromid., gr. xx.; tinct. cannabis indicæ, ♏xv.; mucilag. acaciæ, ʒj.; aq. chlorof. ad ʒj.—ter quotidie.

The ovaries, however, are more apt to become congested in the absence of the natural monthly depletion. Neurotic patients may suffer a severe ovarian dysmenorrhœa after removal of the uterus, or may have ovarian pain independent of any menstrual rhythm. After oophorectomy, patients may suffer from symptoms of endometritis, though this tends to subside in the course of years as the uterus shrinks. Some neurotic subjects even complain of ovarian pain, as bad as before, after the ovaries have been removed, and without any morbid condition of the pedicles or adhesion to explain it.

Climacteric Disturbances.—The cessation of menstruation at the menopause is frequently accompanied by constitutional disturbances of a well-known character, which often last over a period of several years. These are to be attributed, not only to the cessation of the periodical active hyperæmia and discharge of blood to which the system has been accustomed for some thirty-five years, but to that of the expenditure of nervous energy in a particular direction. The chief phenomena, therefore, are signs of plethora, with transient vascular disturbances, inducing flushings of the face, perspirations, or feelings of heat, chilliness, or sinking in the epigastric region and other parts. Vicarious hæmorrhages from the nose and rectum are frequent; the liability to cerebral hæmorrhage is also increased. Any previously existing congestion or inflammation of pelvic organs is liable to undergo a temporary aggravation, after which, as a rule, it tends to subside. In many cases, especially when any previous uterine disturbance has existed, the diminution of menstruation is not gradual and progressive, but long periods of amenorrhœa are interrupted by profuse and often prolonged hæmorrhage, which may arouse a suspicion of the existence of cancer. It is, however, a common mistake among women, and not unknown even amongst medical men, to suppose that the onset or approach of the menopause is an explanation for excessive periods or irregular hæmorrhage without any longer interval than usual having intervened between the periods. Such a condition always calls for local examination, and is not a result of the menopause, though it may be commoner near the time of life when the menopause is expected.

Irregular discharges of nervous energy are usual, and may take the form of headaches, of epileptiform or apoplectiform attacks, or of hysterical manifestations, in those predisposed to that disorder. In other cases the nervous disturbance takes the shape of irritability or depression, which, when there is a constitutional proclivity, sometimes develops into insanity. Sometimes, again, women seek refuge in alcohol from low spirits, or from the pain produced by pelvic disorders or by indigestion, and the foundation of intemperance is not unfrequently laid about this time of life. With the diminution of sexual activity is associated a tendency to corpulence and to deposit of fat about internal organs, which is apt to lead to neglect of outdoor exercise. To this cause are partly to be ascribed the digestive disturbances which often form the most prominent feature of the general condition. They consist mainly of constipation, inactivity of liver, and distension of the abdomen by flatus, with frequent spasmodic and painful contractions of the intestines.

Treatment.—No emmenagogue treatment should be adopted unless the menopause appears to be coming on at a period very long anterior to the normal age; nor, on the other hand, should the intercurrent hæmorrhages, which often afford a natural relief, be checked too suddenly, unless signs of anæmia appear. Local examination should, however, always be made in case of undue hæmorrhage, lest there should be commencing cancer, or an erosion of the cervix, which at such an age is more likely to form the starting-point of cancer, and therefore calls the more urgently for treatment.

Diet should be rather sparing, and patients should be urged to take a due amount of outdoor exercise. The allowance of alcohol should be diminished; beer, porter, and spirits are to be avoided, and claret or other light wine alone taken. Occasional venesection has proved useful, but is hardly an available remedy in the present state of popular opinion. If, however, epileptiform or apoplectiform attacks occur, or very severe headache is associated with an appearance of plethora, leeches to the temples, or cupping, may be employed.

Occasional mercurial purgatives are often useful, and saline laxatives, especially the Hunyadi Janos, or other mineral water. are to be taken daily if required. For the nervous disorders the bromides form the most useful remedies. For the digestive disturbances, alkalies, with a vegetable bitter, taken before meals, or ammonia with aromatics, and a small dose of rhubarb,* are most generally useful. When, however, there is much general debility, mineral acids, combined with tonics, are to be preferred; and nux vomica is often of value for stimulating the muscular walls of the intestines (*see* formula, p. 203). On the view that the menopause implies the diminution or cessation of an internal secretion of the ovary, ovarian extract has been administered, and favourable results have been reported. Its utility cannot, however, be considered as decisively proved.

PSEUDO-CYESIS.—By the term pseudo-cyesis is denoted spurious or imaginary pregnancy. This is not uncommonly one of the neuroses of the climacteric period, and its starting-point is then the enlargement of the abdomen by fat and flatus, combined with the arrest of menstruation. The movements of the distended intestines are often mistaken for the movements of a child, even by women who have the experience of former pregnancies to guide them. The mental condition may be of any degree, from that of a not unnatural mistake, which is at once dispelled by a medical opinion, to that of a delusion amounting to monomania, which is proof against all assurances, and may even persist for a far longer period than the normal duration of pregnancy.

The delusion may also occur at other times, especially soon after marriage, or after illicit intercourse. It may be entertained even though menstruation continues normal, or is merely diminished in quantity, the mistake in such cases being generally based upon corpulent or flatulent enlargement of the abdomen, and imaginary fœtal movements. The breasts, in some cases, are actually developed, and secrete a mucoid fluid, as in pregnancy, though in others the supposed enlargement is simply due to fat. The apparent enlargement of the abdomen is often increased by arching of the back and rigidity of the abdominal muscles.

The diagnosis is generally easily made by the recognition of the small size of the uterus on bimanual examination, and by resonance of the abdomen, although this may be, in some measure, diminished by great thickness of fat. The administration of an anæsthetic will clear up any doubt, and the formality of this proceeding, combined with that of a consultation, is often of use in dispelling the patient's illusion.

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* ℞ Ammon. carb., gr. ij.; tinct. rhei, ♏xxx.; sodæ bicarb. gr. x.; syrup. zingiberis, ʒj.; aq. menth. pip. ad ℥j.—ter quotidie.

DYSPAREUNIA AND VAGINISMUS.—By the word dyspareunia is signified pain or difficulty in sexual intercourse. This symptom is frequently that which leads patients to seek for medical relief, although often they do not mention it until questioned on the subject. It is, therefore, generally desirable in the case of married women to make inquiry on the point when any condition is discovered likely to lead to such a result.

A vaginal examination will generally reveal whether any obstruction exists, due to a rigid or imperfectly-ruptured hymen, to narrowness, cicatricial contraction, or spasm of the vagina; also whether the vagina is unduly short, or the uterus displaced, and whether the tenderness which causes the symptoms is situated at the vulval outlet, the urethra, the vagina, the cervix or body of the uterus, or the ovaries, or is due to periuterine inflammation or tumour. If the tenderness is found to be at the vulval outlet, a careful visual examination with a good light should be made as to its cause, which may be found in some vulvitis, erosion, fissure, lupoid ulceration, or urethral caruncle, which would escape detection by the finger. In the case of dyspareunia coming on for the first time about or after the menopause, a probable cause is kraurosis vulvæ, with its consecutive atrophy and contraction.

The treatment will depend upon the cause which may be discovered, and should, in almost all cases, include abstinence from any attempt at intercourse for a considerable period. It should be especially remembered that any partial retroversion of the uterus, by which its canal is brought nearly into a line with that of the vagina, exposes the cervix to a direct impact to which it is not normally liable, and that this effect is increased if there is any concomitant prolapse.

The word vaginismus denotes a spasmodic contraction of the sphincter vaginæ with the anterior fibres of the levator ani, which takes place upon any attempt at intercourse, and renders intromission difficult or impossible. The same effect is frequently produced by the introduction of the index finger, or even by touching the vulval outlet with a camel-hair brush. In severe cases the spasm not only affects the local muscles, but the muscles of the whole body are thrown into intense energy of resistance by the mere idea of any contact with the vulva, so that intercourse could only be accomplished by absolute violence. In some women who have an excessive nervous dread of the consummation of marriage, even the first attempt at intercourse may be thus prevented. In the great majority of cases, however, two causes are present—a local cause of irritation at the vulva, and a hyperæsthesia of the nerves of that region, almost invariably associated with an extreme general reflex susceptibility, dependent upon, or closely allied to, the hysterical temperament.

Women who suffer in this way are often by no means destitute of sexual desire, but rather the opposite. The spasm of vaginismus is indeed an exaggeration of the contraction of the sphincter muscles normally produced by sexual excitement or pressure on the clitoris, but associated with painful sensitiveness of the mucous membrane on which the spasm causes pressure. The most characteristic cases of vaginismus are those which show themselves from the commencement of married life. The mental distress which is apt to follow often leads to great depression of spirits and impairment of general health. Usually there is no suffering apart from coitus, but sometimes the vulva becomes so hyperæsthetic that sitting and walking are painful, and the patient is reduced to a complete invalid life.

The condition most commonly found as a cause of vaginismus is a vulvitis, most intense towards the posterior part of the vulval outlet, affecting especially the anterior surface of the hymen or its remnant, and sometimes associated with fissures or erosions. This may arise from some original disproportion of parts, or awkwardness on the part of the husband; not unfrequently there is in addition a communication of contagion from a latent gonorrhœa; while in other cases there was a vaginitis or vulvitis existing before marriage, often dependent on the irritation of a uterine leucorrhœa. Over-sensitiveness of the mucous membrane, and of the nervous system generally, induced by masturbation, may in some instances be a cause.

Vaginismus may also be set up by follicular vulvitis, by lacerations of the vaginal or vulval outlet resulting from parturition, by urethral caruncles or other growths at the vulva, or by granular inflammation at the meatus urethræ. The form of superficial ulceration described by Matthews Duncan as a cause of the affection has been already mentioned (*see* p. 605). Kraurosis vulvæ is apt to produce not merely dyspareunia, but vaginismus, commencing after the age of forty.

Treatment.—In all cases of vaginismus, and in many of those of dyspareunia even without vaginismus, the introduction either of cold cream or other oily substance or of glycerine into the vagina before intercourse is a valuable palliative, since whenever there is pain on intercourse, or even a mere absence of sexual feeling, the natural lubricating secretion, poured out abundantly under the influence of emotion, is apt to fail. A little glycerine of starch is perhaps better than any oily preparation, since it increases the natural secretion of the glands, and mixes with it.* In mild cases this plan, together with temporary sexual abstinence, and the treatment of vulvitis or vaginitis by the methods already mentioned (*see* pp. 599, 605)' will prove sufficient.

In a more severe case, the patient should be placed under anæsthesia, and unless the vaginal outlet is then found to be capacious, it should be fully stretched by the fingers until the largest size of Ferguson's speculum can be introduced, and a full-sized Sims' vaginal dilator of glass (Fig. 273, p. 635) should be introduced. This should at first be worn all day, if possible, the patient being kept in bed; afterwards it may be worn for some hours each day, while the treatment of any vulvitis, fissures, or erosions is continued. If this plan fails to effect a cure, after all erosions or lacerations have healed, a careful examination by probe or camel-hair brush should be made, to discover which are the sensitive points. If these prove to be chiefly the remnants of the hymen, Sims' operation should be performed. This consists in dissecting away completely with scissors the whole circuit of the hymen, whether inflamed or not. After the operation the glass dilator should be immediately introduced, and worn for some time. In severe cases of vaginismus, when the hymen is inflamed and very sensitive, it is well to have recourse to this operation without delay. After the removal of the hymen, the vaginal secretion escapes more freely, and any vaginitis is more readily cured. Sometimes deep incisions are made into the loop of the levator ani encircling the vagina. But I consider that gradual dilatation by the glass dilators, successive sizes being used if necessary, is more effective if the patient is persevering in their use.

The most hopeless cases are those in which little or no inflammation can be discovered, but the condition is one of *hyperæsthesia of the vulva*, affecting not only the hymen, but the nymphæ, vestibule, and clitoris, and apparently depending upon a perverted character of the nerves of sexual feeling. This state may produce incurable dyspareunia, even when there is no vaginismus, and may resist not only Sims' operation, but repeated parturition, the application of strong caustics, and even the dissecting off of the whole of the sensitive mucous membrane. Generally those cases are curable in which the vaginismus arises from inflammation, or in which the hyperæsthesia is limited to the hymen, although many months of treatment and of sexual abstinence may be required. Sometimes parturition may effect a cure by effectually dilating the vagina, but severe forms of the affection generally persist notwithstanding.

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* A convenient form of this is amidine, a cosmetic preparation sold by Parry & Garnham, High-street, Southwark, London. It answers better when it has somewhat deliquesced, after exposure to air.

Absence of Sexual Feeling, apart from any dyspareunia, is so dependent upon emotional conditions as to be little amenable to medical treatment. When primary it is often the result of individual peculiarity, but treatment is more frequently sought when it is secondary and acquired. If not associated with a premature menopause, it is more often dependent upon constitutional debility, anæmia, anxiety, or overwork, than upon local causes, and the only remedy is to be found in the removal of these conditions as far as practicable. Among local causes may be mentioned an undue relaxation of vagina, due to subinvolution of that canal after delivery, or to rupture of perineum or prolapse of uterus or vagina; and a want of muscular tone in its walls, associated with chronic leucorrhœa. These causes may be capable of removal. The extractum damianæ liquidum, given in doses of ʒj., appears to deserve in some measure its reputation as a tonic in these cases; but nevertheless it frequently fails.

When from the outset of married life there is sexual apathy, or, at any rate, failure of the natural sexual orgasm on the part of the wife, the cause may be one of the following:—(1) Relative sexual frigidity on the part of the wife. This often undergoes a spontaneous cure by education in course of time. (2) Premature emission on the part of the husband, the result of previous masturbation, excessive excitability, or constitutional debility, so that the wife does not receive sufficient stimulus. This may often be remedied by a second repetition of coitus within a comparatively short interval. Otherwise, the only remedy is tonic or other treatment directed to the husband. (3) A too exclusive limitation of sexual sensibility to the clitoris, which may be the result of masturbation in childhood. This may sometimes be overcome by attention to position, so that the clitoris does not escape a due amount of contact. Otherwise it is apt to be incurable, unless the husband can supply additional digital excitation to the clitoris during coitus, as recommended by some French authorities.

STERILITY.—For the occurrence of conception with the greatest possible facility, it is necessary not only that there should be no deficiency on the part of the male, no dyspareunia or vaginismus, that the ovum should be properly formed and conveyed by the Fallopian tube, and that the uterine mucous membrane should be in a fit state to receive it, but also that the cervical canal should have its normal patency, straightness, and relative direction, should not be obstructed by a plug of mucus too tenacious to be displaced during coitus, and that neither the vaginal nor uterine secretion should have undergone any change rendering it adverse to the life of the spermatozoa. As a rule, the spermatozoa live only for a few hours in the acid vaginal secretion, while in that of the cervix or body of the uterus they may remain alive for a considerable number of days. The direction of the cervical canal should be nearly at right angles to that of the penis, and it is probable that frequently the semen makes its way for a considerable distance into the cervix almost at the moment of emission, not through any active suction by the cervix, nor by exact apposition of the os uteri to the male urethra, nor even by the force of emission, but through the intermittent pressure on the cervix while it is turgid and tense with blood, so that its canal is probably rendered more circular than usual. Hence the occasional failure of vaginal injections after coitus as a prophylactic against pregnancy—a failure which appears to be more frequent in the case of women of emotional temperament. If the direction of the os is changed, as in the case of retroversion or cervical anteflexion, so that it does not dip into the pool of semen in the posterior cul-de-sac, or if the external os is very narrow, or the canal plugged by mucus too tenacious to be displaced by pressure, this mechanism is interfered with. It has been asserted that there is a wide gaping of the os and cervix in the sexual orgasm, but this is not the fact.

These causes of sterility, as well as stenosis or flexion near the internal os, do not render conception impossible, but only diminish its probability. In some cases spermatozoa have effected impregnation by making their way even from outside the vulva through an intact and narrow hymen, or by passing an almost complete atresia of the vagina. If, however, they have not free access to the cervix, there is greater probability of their perishing in the vagina before they can enter it, especially if the vaginal secretion is more adverse than usual to their life. The occurrence of the sexual orgasm on the part of the woman is not necessary to conception, but probably favours the entrance of the semen into the cervical canal. Thus I have known an instance of a woman who had been married for many years, to two husbands in succession, and who, when over forty years old, experienced the sexual orgasm in coitus for the first and only time, and became then for the first time pregnant. There is no evidence to show in what proportion of cases a rapid ascent of semen within the cervix forms an element in the physiology of conception. It is probable that, in most cases, deposition of semen within the vagina is sufficient, provided that there is no morbid condition of the vaginal secretion.

It has been said that a narrow cervix cannot cause sterility because the spermatozoa have to pass through the uterine orifice of the Fallopian tube, which is normally much narrower. It is not known whether the Fallopian tube expands in the sexual orgasm, though the probability appears to be against its doing so, the uterine wall being at that time tense. But even if it does not, the spermatozoa, maintaining their life and activity within the uterus, have ample time to pass the Fallopian tube singly through their own movements. There is quite space enough to allow this, but the probability of its happening must be greater if semen penetrates *en masse* into the safe refuge of the cervix, than if each spermatozoon has to travel from the vagina or from some still more external part.

As a rule, acid solutions are injurious to the vitality of spermatozoa, and saline and very weakly alkaline solutions may tend to promote it, while of injurious fluids few have a more fatal influence than plain water in sufficient quantity. Hence, if the vaginal secretion has an acrid quality, a vaginal injection before intercourse of a solution containing 1 per cent. of common salt and $\frac{1}{10}$ per cent of caustic soda or potash may tend to promote conception. It is generally assumed that the spermatozoa pass along the Fallopian tube, and there meet the ovum, on the analogy of the lower mammalia, in whom spermatozoa have been found in the oviduct, and on the surface of the ovary shortly after coitus. It has been maintained, however, by Lawson Tait and others, that in woman the fertilization of the ovum normally takes place in the uterus, and that the Fallopian tube only allows spermatozoa to pass when it has lost its epithelium, whose cilia naturally produce a current towards the uterus.

Among the commonest conditions associated with primary sterility is an imperfectly developed uterus, with a small external os and cervical anteflexion. In this case the sterility often persists even after the canal has been made patent, a result which is probably due to some other congenital imperfection less easily remedied than the shape of the cervix. Other frequent causes are vaginismus, or any other form of severe dyspareunia, displacements of the uterus, fibroid tumours, stenosis of external or internal os, vaginitis, and cervical and corporeal endometritis.

One of the most important causes of incurable sterility is distortion, obstruction, or atresia of the Fallopian tubes, due to adhesions resulting from pelvic peritonitis. Gonorrhœa has thus a very important influence as an indirect cause of sterility through the medium of peritonitis, as well as through that of vaginitis and endometritis. The views of Noeggerath as to the incurable character and important sequelæ of gonorrhœa have been already mentioned. Besides the causes of sterility depending upon the wife, it may happen that spermatozoa are absent in the semen, even though there is no apparent impotence in the male, and probably the vitality of spermatozoa may vary in different cases. There is also evidence to show that there may be a relative sterility between husband and wife, each being capable of procreation with another person.

The frequent failure of attempts to cure sterility appears to indicate that, in a large proportion of cases, it depends, not upon any mechanical or other obvious cause, but on some inscrutable imperfection in ova or spermatozoa, or in their relation to each other, depending on want of vigour in either parent, or on an unknown cause. This is confirmed by the analogy of animals and plants. Animals in confinement, or in an uncongenial climate, may be sterile, even without any other sign of want of vigour. Plants may be so also, under domestication, or in unfavourable localities. In the human race it has been noticed that heiresses, who are often only children or members of small families, are more apt to be sterile than the average of women. The imperfect fertility which results in animals from breeding in-and-in, or from self-fertilization in plants, is an example of the obscure causes which influence propagation. Another instance of sterility not due to any discoverable local conditions, but rather to the general state of the system, is the usual cessation of child-bearing as women advance in years, some considerable time before the cessation of menstruation, and, probably, before that of ovulation.

Treatment.—The treatment will generally, in this country, be limited to the removal, when possible, of any of the above-mentioned curable causes, the existence of which may be detected, especially vaginitis, cervical and corporeal endometritis, displacements of the uterus, or stenosis of the cervical canal. The most curable form of sterility is that in which some cause exists, preventing the proper performance of coitus, for this can generally be remedied. If this is not the case, and no obvious physical cause is discoverable, the most probable local cause of the sterility is some morbid condition of the endometrium; and it may therefore be advisable to try the effect of dilatation and curetting under an anæsthetic. The indication for this is the greater if there is any dysmenorrhœa, or uterine leucorrhœa.

If there is a history of perimetritis, and symptoms of tubal disease, an abdominal section may possibly allow separation of adhesions and freeing the orifice of the tubes, or making an artificial one, without removal of tubes and ovaries.

Inquiry should be made as to any sign of impotence on the part of the husband; and if any serious operation is contemplated, it is advisable to verify the normal presence of spermatozoa in his semen. If children are desired, coitus should not take place too often, and any vaginal injection, except that of a saline solution like that already mentioned, should be avoided for at least a day afterwards. Conception may follow insemination at any period of the menstrual cycle, but is believed to be most probable either just before or shortly after a period. Which of these occasions is most favourable is not yet determined.

For a complete investigation of causes, it would be necessary to adopt the method of Marion Sims, namely to examine microscopically the cervical mucus for spermatozoa on the day following coitus, and, if none are then found alive, to repeat the examination at shorter intervals, and, if necessary, immediately after that act. In this way may be established the absence of spermatozoa, their immediate expulsion by the vagina. their rapid death either in the vagina or in the cervix, or their failure to penetrate into the cervix. The method of intra-uterine injection of semen has not had sufficient success to outweigh its difficulties and other obvious drawbacks. Out of fifty-five trials made by Marion Sims on six women, conception followed in one case only.

The treatment of sterility is not very hopeful unless the patient comes under observation while still young, and within a few years from the time of marriage, for, at a later stage, the cause of sterility, whatever it may be, is apt to have led to other alterations, not easily removed. It must be admitted that the treatment of sterility is the least successful part of gynæcological therapeutics, since a complete study of its origin is generally forbidden by a sense of delicacy. Those causes of sterility which consist in some obscure condition of the general system, impairing its reproductive vigour, lie almost entirely outside the domain of therapeutics, although a large proportion of the cases may be influenced by them. Prolonged change of air and scene, however, such as is obtained by a visit to Schwalbach or Ems, or other foreign spa, sometimes appears to have a favourable influence on conception, and pregnancy has sometimes occurred unexpectedly after a long separation between husband and wife.

PRURITUS VULVÆ.—Either associated with vulvitis, simple or follicular, or with any morbid condition of the uterus or vagina, an irritation, itching, or burning of the vulva is a frequent and often a very distressing symptom. Sometimes it is combined with a general hyperæsthesia, especially of cutaneous nerves. It is not uncommon in pregnancy or as a symptom of commencing cancer, and is promoted by all causes of active or passive hyperæmia of the sexual organs. It is also common in diabetes and glycosuria, or may be dependent upon a gouty diathesis. Any eruption around the vulva, mycosis of the vulva, pediculi about the pubes, the acarus scabiei, or thread-worms wandering from the rectum, are also among its causes. If it commences after the menopause, it may be due to kraurosis vulvæ in its earlier stages. The itching may extend to the vagina, the anus, and the adjoining skin. It is generally much aggravated by warmth, and hence may render sleep at night almost impossible, while the effect upon the nervous system of the constant or frequently recurring torment is often very severe. In other cases the sexual irritability which results is a source of great annoyance, or may give rise to the habit of masturbation. The scratching excited by the itching aggravates the malady, and is apt to produce vulvitis, if none existed previously. Pruritus vulvæ thus partakes, in great measure, of the character of a neurosis, and in some instances exists without discoverable local cause, but in a considerable proportion of cases it is excited by some local inflammation, or by a discharge, uterine or vaginal, which either sets up actual vulvitis, or at least irritates the terminations of the nerves.

The **Treatment** consists in the discovery and removal of the cause. Diabetes or glycosuria must be treated constitutionally, and the vulva washed and dried, on every occasion, after micturition. Endometritis is to be especially sought for, if no other cause is readily discoverable. In all cases, diet should be sparing, alcohol and spices should be avoided, and extreme cleanliness observed. As a temporary palliative, warm hip-baths at intervals of a few hours are of use. If uterine or vaginal leucorrhœa is the exciting cause, very frequent vaginal injections, used in an effectual manner (*see* p. 204), are to be recommended, and a tampon soaked in glycerine containing acetate of lead or borax may be kept constantly in the vagina. Especially when the irritation is not limited to the vulva, but extends to the vagina, frequent douches with warm infusion of bran are useful. The vulva, if not itself much inflamed, may be protected by unctuous applications, of which the best is vaseline or lanolin, to which may be added acetate of lead (ʒj. ad ℥j.), with acetate of morphia (gr. x. ad ℥j.), chloroform (ʒss. ad ℥j.), or dilute hydrocyanic acid (ʒj. ad ℥j.). An ointment of quinine in vaseline (gr. xxx. ad ℥j.) often gives much relief; or, in place of ointments, the vulva, after the use of a douche, may be powdered by means of an insufflator with boric acid or dermatol.

If there is actual inflammation of the vulva, it is preferable to keep between the labia a pledget of lint soaked in a lotion containing glycerine (ʒj. ad ℥j.), and carbolic acid (gr. iv. ad ℥j.), to which may be added acetate of morphia (gr. ij. ad ℥j.) or dilute hydrocyanic acid (ʒss. ad ℥j.), or a combination of the two. Carbolic acid and glycerine may also be combined with the liquor plumbis subacetatis dilutus. A solution of perchloride of mercury (gr. iv. ad ℥j.) is also a remedy of repute. Infusions of tobacco may be used both as a vaginal douche and for external application. If there is no local inflammation at the vulva, the vagina and cervix may be swabbed over with a solution of carbolic acid in glycerine and water, 1 in 8. Any constitutional disorder must be treated, saline laxatives being generally of use. Bromide of potassium in full doses is often valuable, and opiates, or chloral, must be given to secure sleep in severe cases. When the neurotic element is predominant, quinine or arsenic may be of service. In severe and intractable cases, an operation has been performed for complete removal of all the sensitive area, including the clitoris and nymphæ.

COCCYGODYNIA.—By coccygodynia is meant pain in the situation of the coccyx. It is generally accompanied by tenderness, and is greatly increased by any movement of the sacro-coccygeal joint, or the muscles attached to the coccyx. It is thus usually most acute on defæcation, and on sitting down or rising from the sitting posture. Sometimes pain is also felt on walking or while sitting. Coccygodynia is either a symptom of disease of the coccyx or of its articulation, or it may be, like pruritus vulvæ, a neurosis depending on any source of irritation in the sexual organs, anus, or rectum. In the former case it is generally either the result of injury during parturition, or one received from without, as by horse exercise. In the form of a neurosis, the affection is not uncommon in single women. For diagnosis, the coccyx should be explored between one finger in the vagina or rectum and another used externally. The detection of actual inflammation of the coccyx or of its articulation respectively will be assisted by the degree of tenderness of the bone itself on pressure, or of the pain produced by moving it. When there is no history of any cause likely to have produced inflammation, careful search should be made for a source of reflex irritation.

Treatment.—In the neurotic form of the affection, the chief object is to cure the primary cause. Subcutaneous injections of morphia over the coccyx afford relief. When any local inflammation about the coccyx is diagnosed, leeches may be applied over the seat of pain, followed by repeated counter-irritation. In very obstinate cases a tenotomy knife may be introduced at the tip of the coccyx, and the bone severed from its attachments posteriorly and along its lateral border by subcutaneous incision. If this fails the whole bone may be excised. The latter plan is preferable if the pain is a sequel of actual dislocation, fracture, or ankylosis of the bone. It is only in exceptional cases, however, that surgical interference is desirable.

The following symptoms are sometimes the subject of questions in oral examinations:—

RETENTION OF URINE.—The most important cause of this condition to be looked out for is retroversion or retroflexion of the gravid uterus. The symptom is usually first produced from the third to the fourth month of pregnancy. It is to be noted that no displacement of the normal unimpregnated uterus can ever produce retention of urine. The organic cause next in importance is fibroid tumour of the uterus, especially a fibroid situated low down in the posterior wall of the fundus, or in the cervix. In these cases the retention usually first occurs near the time of commencement of a menstrual period, or a little before it. Ovarian tumours within the pelvis, or other tumours outside the uterus, such as extra-uterine fœtation or hæmatocele, less frequently cause retention. Other organic causes are pressure of the fœtus in labour, a calculus impacted in the urethra, cancer invading the urethra, and stricture of the urethra of inflammatory origin, which is very rare in the female. Of non-organic causes the most frequent is hysterical retention. Retention may also occur in very severe diseases, such as typhus or enteric fever, and after parturition and operations, partly from the effect of position.

INCONTINENCE OF URINE.—It is necessary first to make sure that the incontinence is not an overflow from a distended bladder, due to some cause of retention of urine. In complete incontinence of urine, where the urine flows away continuously, one of the varieties of urinary fistulæ should be looked for. The chief varieties are vesico-vaginal, urethro-vaginal, vesico-utero-vaginal, vesico-uterine, and uretero-vaginal fistulæ, vesico-vaginal being by far the commonest. Sometimes, when a fistula is high up, small, or valvular, the patient is able to retain urine for a short time when in the lying position.

Complete or partial incontinence of urine may also be a neurosis in hysterical or quasi-hysterical subjects, or may result from over-distension of the urethra for exploration of the bladder. Partial incontinence may arise from pressure due to pregnancy or tumours, or from weakness of sphincteric muscles, generally combined with some source of reflex irritability or of pressure, such as cough.

PAINFUL AND FREQUENT MICTURITION is most frequently due to cystitis, or some kidney lesion, sometimes to a merely movable kidney. In other cases it is reflex, and due to some inflammation or congestion of uterus, ovaries, or surrounding parts, especially to perimetritis. The degree of it depends more upon the reflex susceptibility of the patient than the severity of the lesion. Thus there may be extreme vesical tenesmus in a hysterical subject, with the urine perfectly normal, and nothing more discoverable than sexual hypersensitiveness, and slight congestion of mucous membranes. The chief causes of painful micturition are urethritis and vulvitis, especially if of gonorrhœal origin, cystitis, fissure or erosion at the neck of the bladder, calculus (very rare in women), vascular caruncle of urethra, and any inflammatory conditions of uterus or ovaries, or elsewhere in the pelvis, which cause a bearing-down effort to be painful. Among these are specially to be noted perimetritis, and parametritis affecting the cellular tissue around the bladder. Frequent micturition, when not due to cystitis or kidney lesion, is commonly reflex, from some inflammation or congestion of uterus or ovaries.

LEUCORRHŒA, or whites, is a term applied to a white or nearly white discharge escaping from the vulva. It may have a yellowish tinge, especially when dried upon linen. The sources of it may be the uterus, especially the neck of the uterus, the vagina, and the vulval glands. In the majority of cases the main source of it is the cervix uteri, and thus it is synonymous with cervical endometritis, and has been described under that head. In this case the discharge as it escapes from the vulva is milky white, or slightly yellowish, mixed with strings or flakes of tenacious glairy mucus. The discharge produced by the vagina, as seen in cases of vaginal congestion after removal of the uterus, is opaque milky white, rather thick and flaky, consisting chiefly of epithelial scales. The secretion of the vulvo-vaginal glands, which may produce a noticeable discharge under the influence of sexual excitability, is a clear, limpid mucus, less tenacious than the secretion of the cervix uteri. Purulent discharges, which may come from the vulva, vagina, or uterus, are not generally called leucorrhœa.

OFFENSIVE DISCHARGES.—An intensely fœtid character in the discharge from the genital canal, such that the smell clings to the fingers, and can scarcely be removed from them by disinfectants. is produced by cancer in the stage of sloughing, by decomposition of the products of conception, or of a sloughing non-malignant tumour such as a fibroid tumour, or from a long-retained pessary, especially when it has produced ulceration.

Minor degrees of offensiveness in the discharge may occur in cases of endometritis, vaginitis, and vulvitis, chiefly when the discharge is purulent, and, most of all, when it is gonorrhœal. These are much promoted by want of cleanliness.

Swellings at the Vulva.—The following are the chief which have to be distinguished:—Phlegmon or abscess of the cellular tissue, distension or abscess of the duct of the vulvo-vaginal gland, inguinal hernia, hydrocele, growths (epitheliomatous, fibroid, sarcomatous, fatty), syphilitic hypertrophy, tubercle, elephantiasis.

Swellings behind the Cervix Uteri.—The following are the commoner causes of swelling in this position:—Exudation in the pouch of Douglas (which may be lymph, serum, pus, or blood), clotted blood forming hæmatocele, rarely hæmatoma outside the peritoneum, fibroid tumour of uterus, retroflexed fundus uteri, gravid or non-gravid, ovarian tumour, ovary enlarged by inflammation or abscess, distended Fallopian tube, extra-uterine fœtation, cancer of peritoneum, cancer, cellulitis, or syphilitic induration around rectum, scybala in rectum, outgrowths from posterior pelvic wall.

THE END.

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